

COAL AGE

Vol. 5

NEW YORK, APRIL 4, 1914

No. 14

There are plenty of people who really and truly believe that most coal-mine owners are hard-hearted, grasping individuals, who spend their time hatching schemes which will enable them to stifle legitimate competition, or tie down their employees, and a little inquiry among your friends and acquaintances will probably convince you that such opinions are held, not alone by the ignorant, but by many intelligent people who seem to be conscientious seekers after the truth.

Of course, when you ponder a moment and recall that the only interesting articles about the coal industry that appear in the daily papers have to do with explosions (generally attributed to carelessness and greed of the mine owner), strikes (the miners' officials always insist that all violence is incited by the thugs in the employ of the operators) and coal famine among the inhabitants of city tenements during blizzard weather (generally illustrated with cartoons), you will understand how these wrong impressions have been formed.

If you should tell all of your friends that the average profit on a ton of coal, f. o. b. railroal cars at the mine, is under 10c. per ton, most of them would think you crazy and the remainder would be so little impressed by the simple statement, that they would forget about it within the hour.

You must make a startling statement of fact, if you desire to erase an impression created by careless and uninformed news correspondents.

To illustrate: In a certain large city, not so far from a coal district, domestic coal was being delivered at \$4.50 per ton. This \$4.50 was divided as follows:

Lump Coal f. o. b. cars at mine.....	\$1.50
Freight.....	1.60
Hauling in town.....	.50
Retail dealer's commission.....	.90
(This had to absorb all bad debts, etc.)	
	\$4.50

During a period of extreme cold weather, one of the dailies began to feature the usual articles about the robber coal barons. A certain coal baron, having no sense of humor(?), decided to let the newspapers in on the ground floor, and so, made an offer to the associated charities of the city, to donate to them, at the mine, as many tons of coal as the newspapers would agree to have handled by the railroads and then delivered to the needy.

This looked mighty good to everybody; but when the business managers of the newspapers got to figuring, they treated the editor who had stirred up the trouble, to some sure enough excitement, and no newspaper in that city has printed a cartoon, describing coal barons, since that memorable famine.

Ideas and Suggestions

Are the Services of Mine Officials Fully Appreciated?

SYNOPSIS—Many foremen and superintendents spend a lifetime in the service of some companies without proper and adequate remuneration. One sure way to repress loyalty is to cause men to believe they are working for wages alone.

✠

What does the coal-mining business hold out to the average mine foreman and superintendent to stay in the game? We know of several concerns operating a number of mines who can point to men grown gray in ten, fifteen and twenty years' service as foremen or superintendents, while during the period of their service, several general managers and general superintendents imported from other districts have come and gone without achieving any striking or lasting results.

Some of these foremen—excellent fellows by the way—never attained a superintendency, and the best of the superintendents who, by reason of their intelligence and loyalty, achieved such sobriquets as "Old Reliable," "War Horse," etc., never advanced to the position of general superintendent for the company they served so long.

Does it not appear strange that such men continued to give faithful service to one new general manager after another? But the reason is plain. As a rule they stayed because they become fixed in habit and yet believed that perhaps some day the concern would get tired of changing practices, spending money, etc., as the result of importing new managers; and the hope was ever present that they themselves would find their opportunity to fill the coveted place.

After all it only takes two or three such disappointments to make a man realize that he is getting too old to change companies. The result is that many good executives are side-tracked, and knowing how hard it is to pull up and move, they stay and do their best. This is so essential a factor after all to the successful operation of mines, that the job they have is theirs for keeps, but nothing better.

A great deal is heard nowadays about "efficiency." The superintendent more than any other man is expected to get the results, "scientific management" and "efficiency" hope for. But what of the superintendent himself? Is anything in the way of reward held out for him in seeking the accomplishment of almost hopeless tasks? He is the man expected to deliver the goods. Is he sufficiently paid for it?

How many coal-mine superintendents can count *years* between salary advances? Logically and naturally a superintendent is paid what is properly termed an individual rate. He is paid for his worth in the position he holds. The fact that so many men go from one company to another is proof of this. But what of the great number who remain loyal to one concern? Does the management

see that their faithfulness and value because of their experience, etc., are rewarded?

It may not read well in cold print, but there are many honest and efficient men, capable of filling positions as general superintendent and general manager, working today as foremen and superintendents for concerns who have imported from other districts men of far less knowledge of the mining game, and especially of local conditions, to lord it over these same men, because the newcomers bear the official cognomen of general superintendent or general manager. The old employees carry the load and in most cases deserve the credit for any success achieved by the imported "G. M." When the latter did not achieve success, were they let out with him? Certainly not. The company knew better.

It is generally admitted that the man who works just for his pay is not the best workman. However, some companies appear to treat some of their oldest and most loyal employees as if they were working for their wages alone. *They are not.* They are working for the *honor* of proving their faithfulness and loyalty. This is worth as much to some of them as their pay. But the recognition of this honor on the part of the company which should be given in annual salary increases, is in too many cases overlooked or withheld too long.

Loyalty is not going to become extinct. It is a tremendous influence in the adherence of men to one concern for the best years of their lives. When loyalty does become extinct and all men work for pay alone, it will be a sorry state of affairs.

The best way to repress loyalty is to withhold appreciation for it in the salary check. We heard of a man who held a responsible position with a big concern, but whose rate had not been changed for several years, who wrote his boss asking for a change in rate. He said: "Increase it or decrease it, just as you like—what I'm after is a change." It is not going to hurt a good mine foreman or superintendent to voluntarily raise his salary once a year. The man who can't stand it is the one you must locate sooner or later. From those who do stand it, an increasing quality of service will be obtained. Look over the list of your old employees. What you find in the way of salary recognition (or lack of it) may surprise you.

✠

Pass It On

Look over the trade periodicals on your desk this morning; also step out in the back room where you keep your office supplies and take stock of the publications you have piled away for future reference. There must be quite a stack of them out there gathering dust and occupying much needed space. How many times have you gone into that supply room to run through the back numbers and dig out an article you recollect vaguely of having seen some time or other? Not very often; have you?

Again consider those magazines just laid on your desk among the morning's mail. Do you go through them carefully? The chances are that when you pick up one, you turn the pages quickly, noting only the illustrations, until you come to an article bearing on your own particular product. This you skim over hastily, or digest carefully, as the importance of your correspondence allows. Again you move along rapidly, stopping a moment to note market quotations, until finally you toss the magazine to the back of the desk, with the mental remark that you will look through it again when you have more time.

How many men in your organization, or under your orders, ever see that paper to which you can spare only a scant quarter of an hour? Many of those men are ambitious; some are real thinkers. They may need only the word picture of how other men are solving problems common to your business to start them to thinking about the unconquered difficulties right in your own plant.

More than one great manufacturing organization of the present day owes its success to the discovery of the simple truth that the more brains there are focused on

few moments contains the best thoughts of a score or more of men who are top-notchers in their lines.

Has your business got all the benefit possible out of that magazine which you will soon lay aside to continue the morning's dictation? Cannot some of those men, on whom you rely for the smooth and noiseless operation of the business machine, glean one more idea from its pages? Even one useful idea may mean thousands of dollars in plant economies or improved product.

Therefore; for the inspiration of your men and the advancement of your business; after you have read your trade paper, *pass it on.*—Power.

Interesting Ideas Developed at an Alabama Mine

The accompanying photograph illustrates several very interesting ideas that have been developed by W. J. Lovejoy, mine foreman at the Acmar slope of the Alabama Fuel & Iron Co., Acmar, Ala.

In the foreground is a stretcher which can be placed



VIEW AT ACMAR MINE OF ALABAMA FUEL AND IRON CO., IN ALABAMA

certain problems, the better chance those problems have of being quickly and surely solved. Trade books and publications so disposed that they can be looked over and their articles of interest discussed during leisure moments, such as the noon hour, make one of the best ways of awakening interest in the work at hand.

Did you ever think of the tremendous amount of labor required to analyze the latest developments and ideas in a particular field; to investigate the newest apparatus and processes; in short to produce a useful readable business magazine? That periodical into which you look for a

on top of a mine car or a lumber wagon and a patient transported on same will be quite as comfortable as if he were riding in an invalid's carriage.

Just back of the stretcher, is the railed-manway entrance to the mine. Every man entering the mine first passes the fireboss' shack, where he is given instructions by the fireboss, if any instructions are to be given. He then passes through the turnstile, which is shown just under the circular disk fastened to the side of the fireboss' shanty. Around the circumference of this disk are notches which are numbered consecutively, and each time

a man passes through the turnstile, the disk is advanced one notch, thus registering automatically the number of men who have entered the mine.

Just beyond the turnstile are the checkboards; one for in and one for out. With this arrangement, a man cannot forget to see the fireboss before going to work, nor can he enter the mine without being accounted for, to the officials.

Aemar produced the largest tonnage of coal at any mine in Alabama, for the year 1913, namely 443,026 tons. This is a rather remarkable record, considering that the mine was opened in October, 1911, and only ran 275 days during 1913. The coal seam is pitching and all coal is hauled to the surface up a single-track slope.

✽

Pumping in Coal Mining

The question of pumping, in the operation of a coal mine, is a very important and often expensive one. Some of the problems that arise are difficult ones to solve. Especially is this true in mines under shallow cover and in the working of seams that outcrop on the hillside and dip into the hill.

It often happens that the desire to get quick returns has resulted in the coal being worked out close to the crop. On going into mines of this class, it is common to find water coming in from all sides, often in small streams. As long as the flow of water is regular, it is possible, by a proper system of ditching and the use of siphons to conduct the water to sumps located in the mine at convenient points, to control the water and keep the mine in working condition.

It is, however, in the class of mines to which I have referred where the coal along the outcrop has been worked out and surface drainage enters the mine, that the greatest trouble is experienced in reference to keeping the mine in working condition, at certain seasons of the year. During heavy rains and spring freshets, so much water enters the mine through the outcrop, that it is, in many cases, practically impossible to prevent the drowning out of the working places. This condition may continue for several days.

To install a sufficient pumping capacity to handle the water at such times would mean that many pumps would stand idle the greater part of the year. Such inrushes of water cause the operator much uneasiness. The extra pumping equipment may be necessary to insure the safety of his mine, to say nothing of keeping the mine in working condition. A considerable investment is thus often tied up in equipment that is useless a large portion of the time.

It is with the hope of saying something of benefit that will enable some engineer or operator to overcome these difficulties, that I offer this short article. COAL AGE, as a mining paper, has no equal in the way that it gives the reader a wide and practical insight into all kinds of mining questions.

Referring to the conditions I have mentioned, I would advise the building of dams to hold back, temporarily, such an inrush of water as I have described and would suggest that, in the development of almost every mine, there are some vacant or abandoned "flats" or "levels" that have been developed and are being held for the finishing of the dip workings. My suggestion is that, in many instances, such places could be sealed off by a sub-

stantial dam, so as to form a storage reservoir, capable of receiving and holding the quantity of water that is in excess of the regular pumping capacity during any inrush of water into the mine. In adopting such a plan, arrangements should be made by which the water flowing into the mine could be diverted and drained into this reservoir.

By this means, it would only be necessary to maintain a pumping plant of sufficient capacity to handle the average daily amount of water made in the mine. During wet seasons, the water in excess of this daily average amount could be stored in the reservoir thus provided; and, in the drier seasons, the pumps could be made to drain this area.

Wherever such a plan can be adopted, it would save a large and useless equipment and would avoid the additional expense that would be required to provide extra men and fuel for the operation of the pumps, at certain seasons of the year.

✽

Anthracite Dust Not Explosive

HARD-COAL OPERATORS DELIGHTED—PREVIOUS JUDGMENT CONFIRMED

A series of important tests have been conducted during the last two weeks at the Bureau of Mines' station at Pittsburgh, and the experimental mine, near Bruceton, Penn., to determine whether Pennsylvania anthracite dust is explosive when firedamp is present. The culminating experiments were carried on Mar. 24, at the Pittsburgh station in the presence of Messrs. James E. Roderick, chief of the Pennsylvania Department of Mines, Harrisburg; M. J. Brennan, inspector, Pottsville; A. B. Lamb, inspector, Shenandoah; S. J. Jennings, inspector, Pittston; D. T. Davis, inspector, Wilkes-Barre; G. B. Hadesty, division superintendent; Mr. Garner and Mr. Price, representing the Philadelphia and Reading Coal & Iron Co.; W. G. Whildin, general superintendent of the Lehigh Coal & Navigation Co.; W. S. Norton, chief engineer of the Alden Coal Co.; H. R. Owens, of the Lehigh Valley Coal Co.; W. Gordon Thomas, of the Lehigh & Wilkes-Barre Coal Co.; Charles Enzian, the representative of the Bureau of Mines, Wilkes-Barre; George S. Rice, chief mining engineer, and Spencer P. Howell, explosive engineer of the Bureau, both of Pittsburgh.

The tests have been of tremendous interest to all those concerned in mining anthracite, since there are large amounts of anthracite dust unavoidably made in mining, and if the dusts were inflammable it would be a very serious problem, almost impossible to overcome.

The British experiments in their experimental gallery have indicated that the Welsh anthracite is inflammable, and this awakened some doubt whether the Pennsylvania anthracite dust might be inflammable. To the great delight of all who witnessed the tests, not only did the anthracite dust not prove explosive without firedamp being present, but even in an explosive mixture it did not prove inflammable, and also tended to lessen the length of flame of an explosive firedamp mixture.

Chief Roderick believed that the matter was of such great importance to the anthracite industry that he brought four of his inspectors from Luzerne and Schuylkill counties, which contain perhaps the most gaseous mines in the world. He expressed himself as being greatly

pleased with the conclusive demonstrations. While he and other inspectors and operators of the anthracite district have been very positive from results of many years' experience that the anthracite dust was not inflammable when firedamp was not present, they hitherto could not assert that it might not extend the flame of the firedamp explosion. Now they think that it has been shown beyond question that its presence tends to limit rather than extend the flame.

A Safety Caging Device

Last June a patent was granted on a safety device for a shaft cage, which promises to help the "Safety-First" movement. By the use of this invention, the danger of riding a shaft cage is reduced to a minimum. Should anything happen while the cage is in motion, the pressure of a button signals the engineer to stop; likewise signals may be given to raise the cage or lower it as may be desired.

The invention is nothing more than the application of the principle of the electric bell. Fig. 1 shows a vertical section of a shaft, illustrating the method of wiring. Two

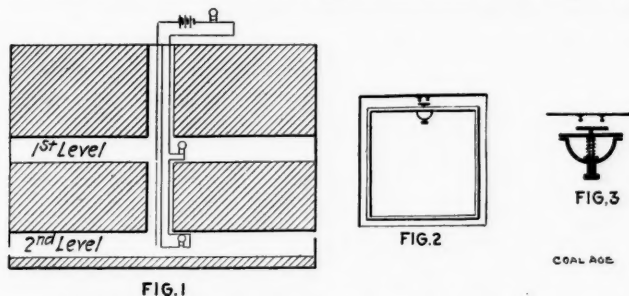


FIG. 1
GENERAL AND DETAIL SKETCH OF APPARATUS

lines of No. 6 copper wire, parallel to each other and about 4 in. apart, are run from the top to the bottom in both compartments of the shaft. These wires are connected with storage batteries and electric bells, one of which is located in the engine room and the others on the different levels, or wherever desired. Fig. 2 shows a plan of a shaft and the relative position of the circuit-closing apparatus is shown in detail in Fig. 3.

The contact bar, which is of copper, is held in position by a coiled spring under tension. When the button is pressed the contact bar touches both shaft wires, thereby completing the circuit and ringing the bells. This is attached to the cage directly under the bonnet and in such a position as not to interfere with the caging of the car or the dumping of the coal.

The argument may be advanced that the device is unreliable in that the circuit may be closed either by the bonnet or other metallic parts of the cage. This can only happen by the offending parts being disarranged and is really an argument in favor of the device, for should such a thing happen, it would merely be a case of the cage reporting that it is in need of prompt attention or possibly immediate repairs.

The apparatus has the approval of government officials and has been installed at No. 15 mine of the O'Gara Coal Co., Carrier Mills, Ill., by Mr. Schellenger, the inventor, at which mine he is employed as hoisting engineer. Those who have tried the device say they have found it to be a complete success.

Mine Caving Prevented by Hydraulic Filling

Hydraulic filling of the abandoned mines in the anthracite region is the only solution of the mine-cave problem, in the opinion of Charles Enzian, local engineer for the anthracite district of the Federal Bureau of Mines, who has just submitted a report to the Federal Department of Labor, embodying recommendations as to what is best to be done.

Mr. Enzian states that hydraulic filling is practicable and profitable, and was devised for the double purpose of disposing of refuse and the reclaiming of pillars. He states that it is also bringing about the elimination of the unsightly spoil banks, and that this waste, caused by an exacting market, will soon be the exception rather than the rule.

He also maintains that it will eventually prevent the pollution of streams and injury of river flats, which are subject, after floods, to deposits of culm mixed with fine clay, loam and silt.

"State and local regulation," he continued, "were directed against such conditions and a number of civil and criminal suits at law hastened the installation of the filling systems, the operations of which produced, and will continue to produce, valuable results."

"The extent of stream pollution and of land damage as a result of dumping mine refuse along water-courses is often under-estimated, but may be realized by a casual survey along rivers with tributaries among the coal fields. Almost every spring the tributaries overflow their banks and enormous quantities of culm and silt are washed into the rivers, which deposit the mixtures on the lowlands and in the channels of the rivers."

"Not only is the transported material a source of destruction to vegetation along the bottom lands, but the action of the streams involves a great waste of natural resources, as proven by the fact that during the years of 1910 and 1911, over 90,000 tons of coal were dredged from the North Branch of the Susquehanna River, several miles below Wilkes-Barre."

Mr. Enzian points out the fear entertained by property holders and contends that hydraulic filling should be utilized more extensively because it permits of higher extraction, will prevent cave-ins and will prove valuable in extinguishing mine fires and for arresting squeezes.

He points out the aid which can be given by cities, saying that ashes and garbage, by proper arrangements, could be dumped near hydraulic filling plants and by this means conveyed into the mines at predetermined points. Mr. Enzian also suggests that many industrial plants could use this very system to advantage. Railroad companies could, moreover, secure large quantities without much expense by conveying the ashes from the industrial centers in the cars that are now taken back empty.

"The availability of sand, gravel, loam and river silt are now limited to the northern field," he continued, "but if the various glacial silt deposits in the Wyoming and Lackawanna Valleys can be made available the problem of procuring material for hydraulic mine filling can be considerably simplified."

He stated that several attempts had been made, but failed, and that he believed the failures due more to lack of persistent effort and to crude methods than to the engineering impossibility. He also pointed out that along the Lehigh Valley, as far east as Bethlehem, and in the iron- and zinc-ore belts of New Jersey, large quantities of zinc slag could be obtained. Mr. Enzian contended that crushed stone might also be used, though its practicability has not yet been determined. He inferred, however, that the cost would not be so great as imagined.

Self-Starting Motors for Mine Pumps

BY W. H. EASTON*

SYNOPSIS—Some notes and comments on the advantages of self-starting electrical apparatus, as applied to coal mining. Remote control is one factor that may often be used to advantage.

The self-starting, direct-current electric motor for mine service is a comparatively recent innovation, but it has proved highly successful in operation and has become popular among operators who have used it. Mechanically, the self-starting motor is similar in every respect to the ordinary direct-current motor and most of the electrical features are the same, the only difference being in the fields. In the ordinary motor the fields are usually "lightly compounded"; that is, there is a shunt-field winding and a light-series winding. In the self-starting motor a heavy-series winding takes the place of the light one.

The difference from an operating standpoint is that the ordinary direct-current motor must be started by

sary to start them, a loss entirely eliminated by the self-starting motor.

2. *Elimination of the Starting Box*—Since the starting box is eliminated, it follows that the motor connections are of the simplest possible character with no contacts, resistance, and complicated wiring to cause trouble as a result of dampness and corrosion. While starting boxes can be obtained that are proof against corrosion, it is obviously advantageous to do away with them.

3. *Compactness of the Equipment*—The unit formed by the pump and motor is entirely self-contained except for a simple knife switch. It is, therefore, more easily installed and moved than the ordinary type with its starting box and wiring.

Direct-current, self-starting motors can be furnished in sizes up to 20 hp. for 220- and 500-volt circuits. The maximum full-load speed is 1100 r.p.m., as this type of construction is not practicable with motors of higher speeds. Squirrel-cage alternating-current motors of the same ratings can also be thrown directly on the line, but no special changes in construction are required for this type of motor.

Starting Current—One fact that must be borne in mind with these motors is that on starting they draw several times full-load current from the line. This is ordinarily of no importance since the time during which this heavy current is required is short and the starts are few. Under some circumstances, however, the heavy load proves objectionable. By dividing up the motors into several groups so that only a few are started at once, the total instantaneous rush of current may be reduced.

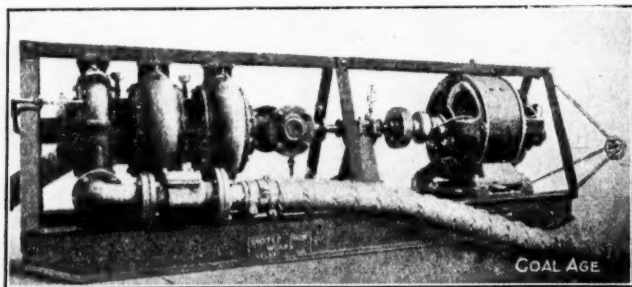
Speed Regulation—Another factor of importance is that the no-load speed of these motors is greater (sometimes as much as 50 per cent.) than the full-load speed. Where the motor is directly connected to the load this is of no importance, but they are not well adapted to driving machines that may be lightly loaded or to connection by means of belts since the belts may break.

APPLICATIONS

The self-starting motor finds its ideal application to the centrifugal pump and mine fan or blower. It has demonstrated its usefulness in this field and a large number have been in successful service for several years.

It has also been used extensively for driving triplex plunger pumps, although the motor manufacturer has been loath to recommend it for this service. It has, however, made good for this purpose, and if the motor manufacturer is fully informed of the intended application, he can, in most cases, supply a satisfactory drive. Crushers, coal conveyors and other machines have also been successfully driven by these motors, but the same caution applies to these uses. For damp locations, the coils should be impregnated so as to render them moisture-proof. This process greatly adds to the reliability of the motor under the severe conditions of mine service.

The price, it may be said, is but little higher than that of the ordinary compound-wound motor of corresponding size and speed. Vertical, inclosed, back-gear and other modified types, as well as the standard horizontal open type, can be obtained.



TYPICAL APPLICATION OF DIRECT-CURRENT SELF-STARTING MOTOR. PUMP IS MOUNTED ON A SKID TO BE LOWERED DOWN AN INCLINE

means of a starting box, in which there are several steps of resistance that must be cut out gradually as the motor speeds up; if the motor, while at rest, were subjected to the full strength of the current, it would simply burn up. The self-starting motor, however, by virtue of its heavy series field, can be connected directly to the line and will start gradually and without injury.

ADVANTAGES OF THE SELF-STARTING MOTOR

This motor has three distinct advantages, as follows:

1. *Possibility of Remote Control*—The ordinary motor must in general be started by visiting the motor and turning the lever of the starting box by hand. The self-starting motor needs no such attention. All that is necessary is to close the circuit-breaker of the motor circuit in the power house and the motors start up automatically.

Furthermore, when the power fails temporarily for any reason, the motors, of course, stop, but when the power returns the self-starting motors start up at the same time. Ordinary direct-current motors will not do this, as the starting box is so arranged that it is automatically thrown to the off position when the power fails and so each must be visited in turn. Where there are many widely scattered motors, considerable time is neces-

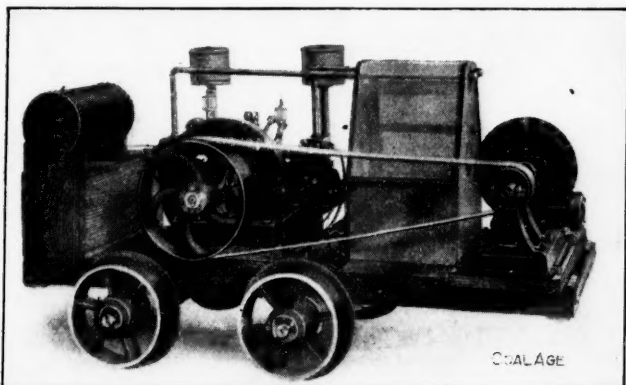
*Westinghouse Co., East Pittsburgh, Penn.

A Portable Self-Contained Mine Pump

BY A. W. DICKINSON*

In many mining districts, where the deposits sought have only a shallow cover, the ingenuity of the operator is frequently taxed to devise a means of ridding the workings of surface water. Where the area of the mine is small, and the water can be easily drained to a central point, it is a simple matter, but where the mine covers a considerable area and electric power is not available scattered bodies of water may become troublesome.

In the Bevier coal field in Macon Co., Missouri, the Central Coal & Coke Co., of Kansas City, operates a slope opening known as Mine No. 25. The coal bed is



A UNIQUE STYLE OF PORTABLE MINE PUMP DESIGNED FOR SPECIAL SERVICE

flat and the face is nearly a mile from the slope collar. As the cover is thin (in many places not exceeding 30 ft.), there are numerous fissures or cave-holes which allow water to enter. Where the influx from such sources cannot be ditched to a sump, it is necessary to employ water-boxes.

The water-box may be efficient for small quantities of water on a haul not exceeding 600 ft. in length, but if it is necessary to move the liquid further, other means should be used, as the water-box is not only costly for long hauls, but interferes with gathering.

The writer conceived the idea of placing a number of pump stations near the working face, where the water was giving trouble, and utilizing a portable gasoline-engine-driven pump. Five stations were accordingly located with a pump at each. Two holes were drilled from the surface at each station, one to take a 1½-in. pipe and the other a 2-in. pipe. A gasoline engine of 8 hp., and a centrifugal pump with 2-in. suction and 1½-in. discharge were arranged on a mine car bed and the unit started on its rounds. The exhaust from the engine was led up the 2-in. pipe to the surface, while the discharge of the pump passed up the 1½-in. pipe.

This pumping outfit in charge of one man was in continuous operation for 8 months, being a success and, to a large extent, solving the water problem. At the end of this time, the Hayton Pump Co., of Quincy, Ill., following my suggestions, furnished another similar portable unit shown in illustration.

Four pumps of this type are at the present time in use, the metal of each having successfully withstood the action of the acid water and the grit from the sump.

*Superintendent, Central Coal & Coke Co., Kansas City, Mo.

A New Horizontal Mine Pump

An interesting type of horizontal mine pump is that which recently has been placed on the market by the Deming Co., of Salem, Ohio.

The air chamber is built very low and broad, so that the pump can be taken into shallow entries. Access to the discharge valve is obtained by removing the air-chamber, which is held in place by six bolts. The water end is unusually heavy, being constructed of cast iron to resist mine water. The valves are of rubber and are mounted on bronze grid seats screwed into the deck. The piston rod is of bronze and works through a deep

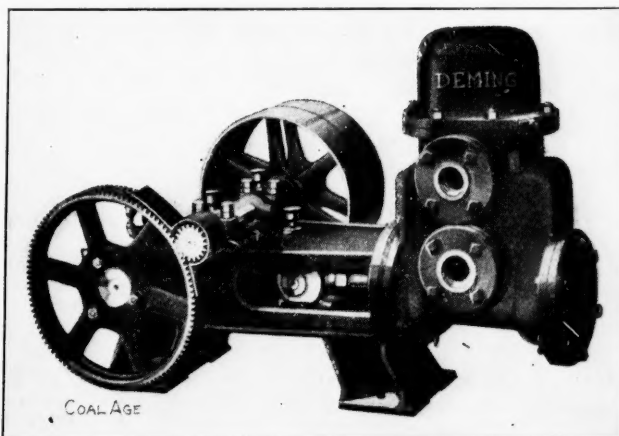


FIG. 1. A 6x6-IN. PUMP HAVING CAPACITY OF 55 GAL. PER MIN.

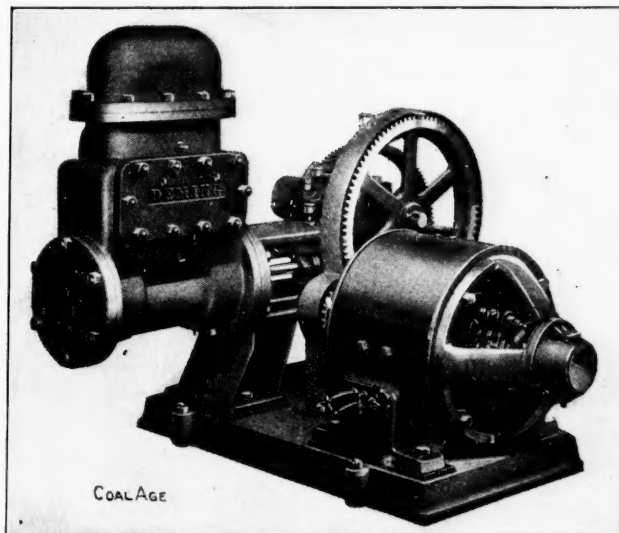


FIG. 2. SAME PUMP FITTED WITH SUB-BASE AND GEARING CONNECTION FOR MOTOR

stuffing-box with bolted gland. The cylinder is fitted with a heavy bronze liner.

The illustrations show the 6x6-in. pump, which has a capacity of 55 gal. per min., when running at 55 revolutions. These 6x6-in. pumps are fitted with 3-in. suction and 2½-in. discharge pipes.

The standard construction includes tight and loose pulleys, with grease cups and wrenches, as shown in Fig. 1. The pump can also be fitted with a sub-base, and with gearing connection for the motor, as shown in Fig. 2. These pumps are intended for a 75-lb. pressure.

The Proper Choice and Care of Mine Pumps

BY C. W. CRAWFORD*

SYNOPSIS—The writer gives a few practical pointers showing what conditions should be considered in erecting a mine pump and what precautions should be taken to secure to it the best results and longest life.

The discharging of water and the choice and care of pumps are prime sources of worry in mining operations. No operator can go home at night with assurance that his mine will be running in the morning; the superintendent is liable to call at any hour, and the mine even may be laid out for days at a time. Pumps are chosen for their local popularity, or for their cheapness; and, more often than otherwise, too small a pump is installed, with the result that it must be pushed beyond its endurance. Fifty strokes a minute is fast enough for the majority of pumps, but the pump makers recommend one hundred, hence the user is encouraged to thrash his pump to death before he realizes it.

Pumps are erected usually by the pump man, who uses whatever material he can get; the superintendent ordering whatever equipment he has in stock, if any, which is usually one or two sizes too small—never too large. Short elbows are used almost universally and air chambers frequently are ignored. No thought is given to the velocity of the water in the pipes; a pump being considered a good one when it discharges, horizontally, a full pipe at the surface, regardless of power and obstructions.

The water is compelled to travel at six or seven times the velocity of the piston, instead of three or four, with the result that half the power is absorbed in friction and in butting against short elbows. Usually, the air chamber is water-lagged, and the column of water has to be started at each stroke from a dead rest. Frequently, the air is let out of the air chamber by a cock at the top, or half way up. No provision is ever made to supply the air chamber with air, unless by an unintentional leaky suction pipe. Packing of the piston is neglected as long as water appears at the top, and the sloshing backward and forward on the piston head of the loose packing and the follower often cause broken pump rods. Bad or cheap packing is sufficient cause for scoring cylinders and pump rods.

These are some of the abuses mine pumps are subjected to, but many of them can be, and ought to be, corrected. Acid mine water can neither be ignored nor combatted with impunity or any hope of permanent elimination. Pumps are made comparatively acid-proof, but it requires the utmost effort of the pump maker and the pump user to accomplish even moderate success, and they do not always work together. "Where there's a will, there's a way," and confident coöperation of pump maker and pump user could be made to alleviate somewhat the ills both parties have to contend with.

Pumps generally are ordered too small to meet the increased flow that is sure to come, forgetting that slower

speed and fewer hours per day mean ultimate saving. The wear of a pump is in proportion to the distance traveled by the piston, regardless of the quantity of water discharged. The power expended is equal to the horsepower of the load plus the friction of water in the pipes, plus the obstruction of elbows, through this latter can be reduced by using long elbows. In the absence of long elbows, two 45-deg. elbows with a nipple between are a good substitute. Pipes larger than are prescribed by the pump maker ought to be used—the larger the better. Suction pipes should be fitted air-tight, and should have an air cock to admit a small quantity of air to replenish that carried out of the air chamber by the water. It is not known generally that water under pressure in contact with air absorbs the air, thereby reducing the hydrostatic pressure of the column and exhausting the air chamber, with the result that a constant supply of air is required to keep the air chamber filled. The folly of the pump engineer letting this air escape by a cock is too preposterous for common belief, nevertheless it frequently is done.

Pump pistons, or plungers, ought to be packed with soft packing—the softer the better—but braided, and filled with tallow and graphite. The packing should be screwed up solid and kept so by frequent examination. Also, the packing should be renewed frequently by repacking with the same material refilled with tallow and graphite. If this were done, cylinders of genuine babbitt metal could be used in all acid mine waters, as well as pump rods covered with genuine babbitt. This bit of information may be rated as superfluous by pump men, but it already is being used with success and general satisfaction.

Pump cylinders generally are made of a composition called bronze, or phosphor-bronze, containing zinc. The zinc is used to obviate the air bubbles that are inevitable in casting copper and tin-phosphorus, being a scavenger, to clean the metal; the zinc fills up the chinks, as it were, and makes the metal solid. It is doubtful if the zinc fully combines chemically with the copper and tin. Anyway, the acid water dissolves the zinc and leaves the face of the cylinder as rough as a sheet of sandpaper. Pure phosphor-bronze, without zinc, wears smooth, but is a very rare composition, owing to the difficulty of eliminating air bubbles, and few shops use it.

Lead-lined pumps have met with unqualified success, being invulnerable against the corrosive action of mine water. In some localities pumps could not be used at all—the water being hoisted in tanks under the cage—until the introduction of the lead-lined pump. Ordinarily, pumps lasted six months, and solid bronze pumps one year, in extremely acid mine water, whereas the lead-lined variety are good indefinitely.

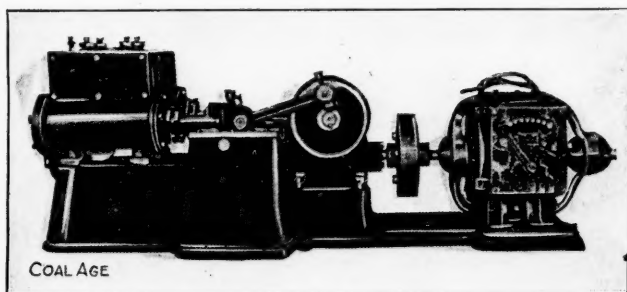
Electric motors have the perversity of running at their own power and speed, and hence the pump must have a resistance equal to the power of the motor. If its load is greater, it becomes overloaded, and the gearing and frame, therefore, must be inordinately strong, and apparently out of proportion with steam-driven pumps.

*President, Crawford & McCrimmon Co., Brazil, Ind.

Geared motor pumps are noisy and subject to breakage of gear; therefore, the general practice now is to drive with belts. Belts for this purpose in mines must be waterproof, and pumps equipped in this manner should be driven only at moderate speed.

A New Mine Pump

The J. C. Stine Co., Tyrone, Penn., have recently put on the market a new, direct-connected, electric, mine pump especially designed for hard service. A number of these pumps have now been in service in the mines of some of the largest coal companies for several months past and have given good satisfaction in every case. Some of these in use are operating under severe conditions; one in particular is reported as having been in operation 24 hr. a day during the past three months. Comparing the



THE J. C. STINE ELECTRICAL MINE PUMP

work performed by this pump with that of two other pumps manufactured by two of the largest pump builders in this country, one mine superintendent pronounces it as, beyond question, the best pump in operation in his mines. This superintendent has 15 electrically driven pumps working in the mines in his charge.

The J. C. Stine duplex pump is fully described in a circular just off the press and which enumerates its several special features, among which are the following:

The duplex cylinders are double acting and cast in a single piece. The power and water ends of the pump together with the intermediate connections are mounted on one solid casting, with all faces properly machined to permit any part to be taken off for examination or repair or to be replaced, without disturbing the other parts.

A balance-wheel coupling on the motor shaft absorbs all shocks or pulsations incidental to high-speed machinery and gives a constant torque. The speed-reducing device is said to be absolutely noiseless and simple, consisting of a bronze worm gear, meshing into a polished worm of high-carbon steel previously hardened. These worms are cut at such an angle as to give the highest possible efficiency, which careful tests have shown to yield 97 per cent. of power transmitted. The worms run in a bath of oil, being inclosed in a cast-iron gear case absolutely tight. The bearings are bushed with bronze, the bushings being renewable at slight cost; but this is not often required, owing to their being immersed in oil. Ball-thrust bearings at the ends of the worm shafts greatly reduce and practically eliminate friction.

Careful attention has been given to the anti-corrosive qualities of this pump. The cylinder castings are of dense cast iron, the cylinders being bushed with anti-acid metal. Where the mine water is very corrosive, the en-

tire cylinder is cast in anti-acid metal, at a slightly extra cost. There are eight valve seats of large area, to permit the ready flow of water with slight frictional loss. They are made of anti-acid metal, accurately fitted and interchangeable. The valves likewise are of anti-acid metal filled with vulcanized india rubber, the metal casing resisting the pressure and protecting the rubber valves, which may be reversed, giving twice the wear.

The side plates, one on each cylinder, furnish ready access to the valves, which is an important feature in the design of mine pumps. All important parts exposed to corrosive action or wear are made of anti-acid metal or special Tobin bronze. The crossheads are fitted with large babbitted-bearing surfaces and have large, removable crosshead pins. The connecting-rods are of steel, both ends being bushed with renewable bronze bushings. The cranks are set at right angles on the crankshaft.

The Alberger Pumps of the Pennsylvania Coal Co.

About two years ago the Alberger Pump & Condenser Co. built for the Pennsylvania Coal Co. two turbo-centrifugal motor-driven sinking pumps. These units are being used for unwatering service in a mine which has been flooded for some time and is now being reclaimed. Each unit consists of a two-stage vertical-shaft centrifugal pump, with a circular cast-iron cradle-piece mounted on the pump body, on which the driving motor is supported. Each unit is 4 ft. 4 in. in diameter by 10 ft. 9 in. high, so that it is small enough to be lowered through practically any mine or water shaft. In this installation each unit is mounted in a steel float of sufficient depth and buoyancy to carry the load imposed by the equipment, and designed to lower in a shaft approximately 6x10 ft. between guides. Rods and bails are also provided for raising or lowering the unit as required.

Each pump has a capacity of 2000 gal. per min. against a total dynamic head of 350 ft., when operating at the full-load speed of an 1800-r.p.m., 60-cycle induction motor. The head of 350 ft. is the maximum which will be encountered in this case, but at the beginning of the operation when the water was high in the shaft, the head was about 100 ft. By correct impeller design the increase of load under heads lower than normal, which is characteristic of centrifugal pumps, is so limited that a 300-hp. motor is not overloaded under any condition of capacity or head. This is a desirable and valuable condition as it permits of handling all of the water which the pump will pass at the lower heads with a wide-open valve, and without increasing the load imposed on the motor to any considerable extent. Therefore, the gain in gallons per minute pumped is considerable, with a corresponding reduction in the time required for the whole operation.

In case the unit is required to operate in future in some location where the shaft is smaller, the pumps and motors can be removed from the floats, and as each unit is self-contained, it can be supported by a frame or bails and lowered by a hoist.

Inaccessibility in the working location was one of the principal difficulties encountered, but was successfully overcome, and the installation today represents a marked advance in the method of dealing with unwatering problems in the anthracite field, and one for which the engineers of the Pennsylvania Coal Co. deserve great credit.

Combined Air Lift and Pumping System

By LEWIS JONES*

SYNOPSIS—General requirements of the Pohle air-lift compared with the systems in common use of pumping with steam or compressed air. Advantages of the Jones' combined air-lift and pumping system.

The Pohle air lift used in pumping water from a depth below the surface, is too well known to require a special description. As early as 1885, Doctor Pohle experimented with air introduced into the water column, which was thereby overbalanced by the greater weight of a shorter water column and, as a result, the water was lifted to the surface without pumping. It can be readily understood, however, that this system would require at least a 50 per cent. submergence of the column pipe, in order that the system may work with reasonable efficiency; and this was found not to exceed 65 per cent. at the best. For that reason, the application of the system, in practice, has been limited.

In his application for letters patent, Doctor Pohle showed the adaptation of his pumping system to mines, by sinking a well hole below the level of the sump in the mine and allowing the mine water to flow into this well. In the development of the system, it was further suggested that the air lift could be divided into stages.

For example, a submergence of the first water column to a depth of 50 ft. below the level of the sump in the mine, would suffice to raise the water to a height of 50 ft. above that level, by means of the air lift. At this point, the water was discharged into a standpipe, the lower end of which was at the level of the sump in the mine. This standpipe gave a submergence of another 50 ft. for the second-stage column pipe; and by its means the water was raised to a height of 100 ft. above the sump level.

As the efficiency of each stage would range downward from 65 per cent., the final efficiency of a multi-stage air lift is necessarily very small. It is these features of low efficiency and necessary submergence that makes the general application of the air-lift system prohibitive in most cases of mining. Its legitimate field of operation is confined to the pumping of deep wells in which the water rises to a height sufficient to give the necessary submergence of the column pipe.

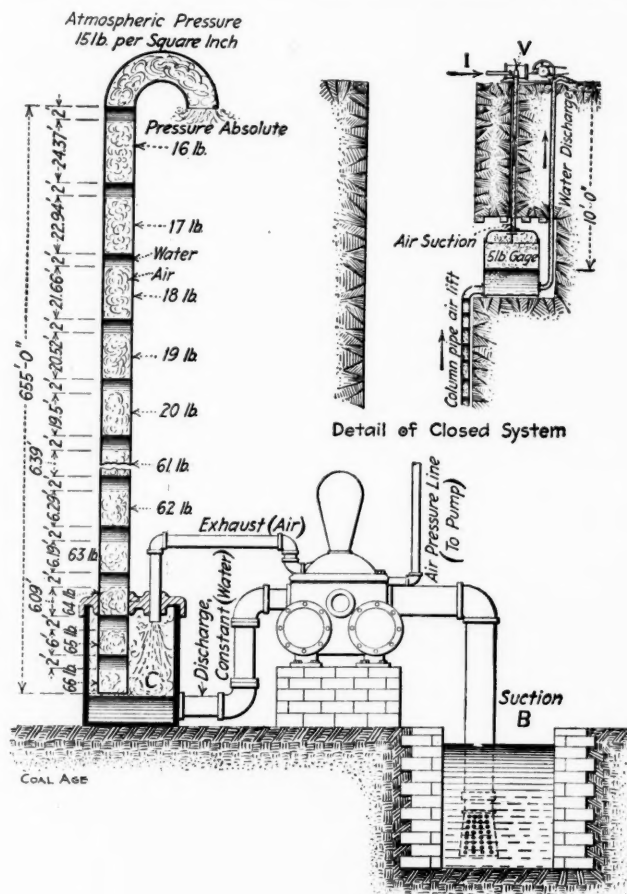
The most common system of pumping used in mining employs the direct-acting piston or plunger pump, which is generally operated by steam; but, in many cases, owing to the large losses by radiation in conducting the steam from the power plant to the pump, air is being substituted to operate the pump. The efficiency of the average direct-acting steam pump rarely exceeds 50 per cent. of the indicated horsepower of the steam cylinder, and often ranges as low as 40 per cent.

In the use of air for the operation of the pump, there are other considerable losses, the chief of which, perhaps, arises from the necessity of carrying the full air pressure for practically the entire length of the stroke, thus prevent-

ing the utilization of the expansion of the air in the cylinder. This full air pressure is necessary in pumping, because of the constant load and the absence of the fly-wheel for storing up the power in the early part of the stroke, for utilization in the latter part, during expansion. As compared with a first-class steam engine, the direct-acting steam pump uses from six to ten times the amount of steam, because of the inability to utilize its expansive power in the cylinder. This is also true in the use of air for operating the pump.

THE COMBINED AIR LIFT AND PUMPING SYSTEM

With a full knowledge of these conditions and requirements, Lewis Jones has devised a combined pumping-



COMBINED AIR LIFT AND PUMPING SYSTEM

and-air-lift system, known as the Jones System of Compressed-Air Pumping. The general arrangement of the system is shown in the accompanying illustration. The prime mover in the system is a direct double-acting piston or plunger pump operated by compressed air. To this extent, the arrangement is identical with that of an ordinary compressed-air pumping plant.

The special feature by which the Jones system of pumping differs from the common system is the utilization of the exhaust air of the engine, which is conducted

*Brooklyn, N. Y.

directly into the air chamber *C*, into which the pump discharges the water drawn from the sump or basin *B*, shown on the right. At each stroke of the pump the water discharged into the chamber *C* rises to a certain level in the pipe and in the chamber alike, which level is determined by the equilibrium of pressures between the water and the air exhausted into the chamber. The pressure of the air overcoming that of the water drives the latter into the column pipe until the water level in the chamber sinks sufficiently to allow of the entrance of the air into the pipe. This is followed by a fall of air pressure in the chamber and the water again rises in the chamber to a certain level, as before. The action is thus intermittent, filling the column pipe alternately with air and water.

ADVANTAGES OF THE COMBINED SYSTEM

Another special feature that makes this system superior to the Pohle air lift is the exact measurement of the air and water by the pump, which acts as a meter for both air and water. The combined air-lift-and-pumping system is also superior to direct pumping by air or steam, in two respects: 1. For the same air or steam pressure, water is lifted to a greater height because of the decreased density and weight of the water column, consisting of air and water combined. 2. Since the air expands freely as it rises in the column pipe, its expansive force is wholly utilized in this system. This expansion of the air, as it rises in the column pipe, is illustrated in the accompanying figure, which shows alternate layers of air and water; but, while the thickness of the water layers remains constant, and is shown as 2 ft., the thickness of the air layers increases from 6 ft. at the bottom to 24.37 ft. at the top of the pipe.

In his illustration, Mr. Jones has taken the trouble, estimating on a gage pressure of 50 lb. per sq.in., at sea level (65 lb. absolute), to calculate the exact thickness of each layer of air alternating with a water layer corresponding to 1 lb., or a thickness of $1 \div 0.434 = 2.3$ ft. The result of this calculation showed that, ignoring the friction in the pipe, water would be lifted a height of 655 ft. by a gage pressure of 50 lb. Assuming a discharge of, say 400 gal. per min. through a 5-in. column pipe, the friction of the water flowing through the pipe would reduce this head less than 50 ft., making the actual possible lift, under these conditions, somewhat over 600 ft.

In the usual system of pumping by steam or compressed air, without the assistance of the air lift, a gage pressure of 50 lb. per sq.in. would not elevate the water to exceed 100 ft. in vertical height. As previously stated, for the purposes of the present calculation, a size of pump cylinder and piston speed were assumed such as to give a thickness of water layer, corresponding to each stroke of the pump, of 2.3 ft., which represents a pressure of 1 lb. per sq.in. The pressure exerted by the uppermost layer of water, in the column pipe, on the air beneath it would thus be 1-lb. gage, or 16 lb. absolute. Each successive layer downward exerts an additional pressure of 1 lb. on the air beneath, as indicated in the figure. Although the actual distribution of the air in the water, in the column pipe, will vary more or less from this theoretical representation, the effect is the same.

Reference has been made to the utilization, in this system, of the expansive power of the air, which expansion is carried farther here and made more complete than in our

best multi-cylinder engines when exhausting against atmospheric pressure. It has long been the ambition of designers of steam engines to accomplish this desideratum, in high-class engines; but it has been found impossible of accomplishment in engines of the reciprocating type. The employment of the air lift in combination with a pumping system, as contemplated by the Jones system, therefore, accomplishes that which has been mechanically impossible in reciprocating engines, and affords the largest possible recovery of energy.

The small amount of air absorbed by the water, in this system, is negligible. Also, the slippage of air past the piston in the air cylinder is counter-balanced by the effect of its later presence in the column pipe. A point of no little importance is the fact that the friction of packing is very much less under the low pressures required in this system. Not only is this true, but less trouble is experienced with leaky joints and valves, under the reduced pressure. In the ordinary system of pumping, a greater thickness of pipe is required in the lower sections of the column, and the pump is generally of heavier build. The combined air-lift and pumping system thus presents many points of superiority over the system in common use.

Another point worthy of mention is the fact that, in case the pump is moved to a lower level, and the head thereby increased against which the pump must operate, a distinct advantage is obtained by arranging a bypass to admit a sufficient quantity of air into the column pipe so as to reduce the head and enable the pump to perform its work under the same gage pressure as was employed at the higher level. The freezing at the exhaust of the air cylinder, so common to pumps operated by compressed air, is entirely avoided when the exhaust of the air cylinder is carried into the air chamber, as in this system.

THE CLOSED SYSTEM

There is some economy to be derived in the operation of the compressor by adopting what is known as the "Closed System," which is illustrated in the detailed sketch shown in the accompanying figure. In this system a closed tank *T*, made of boiler iron, is set in a space prepared for it in the side of the shaft near the top; but at such distance below the surface as to maintain a static head or air pressure, in the tank, of from 5 to 10 lb. per sq.in. The 5-lb. gage pressure marked in the illustration will elevate the water from the tank to the surface a distance of 10 ft.

In this system, the air and water from the column pipe discharge into the tank near the bottom, the air rising to the upper portion of the tank, where it is drawn off by the compressor. An automatic valve *V*, in the air pipe leading to the compressor, is so arranged that if the tank pressure falls below the required static head, the valve shifts and the compressor draws its supply of air from the atmosphere, by the intake pipe *I*. The static head maintained in the tank forces the water up the discharge pipe to the surface.

The advantage of the closed system is that air is delivered to the compressor under a pressure equal to the static head plus the atmospheric pressure, thereby increasing the efficiency of the compressor. Owing to the absorption of some of the air in the water, the compressor is compelled to take air from the atmosphere to supply this deficiency, but the action is automatic.

A Mammoth Mine Pump

SYNOPSIS—Describes a most ingenious design of pump built for a service of 2500 gal. per minute against a 750 ft. vertical head.

✂

The Scranton Pump Co. recently installed for the Lytle Coal Co., Lytle, Pa., a compound condensing mine pump, considered by engineers to be a most modern and ingenious design.

The conditions under which the pump had to operate were exceptional, and many special mechanical features had to be incorporated to overcome the obstacles. Conditions of service demanded a pump to handle 2500 gal. per minute against a vertical head of 750 ft., with steam pressure ranging from 70 to 110 lb. On account of varying steam pressure, and the fact that 24 hours service was required, it was necessary to use a 30-in. steam cylinder provided with cut-off valves with a patented adjustment

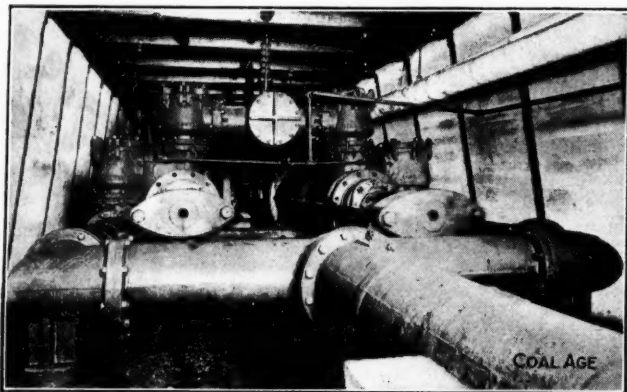


FIG. 1. VIEW OF PUMP ROOM, PUMP AND CONDENSER

which could be set while the pump was operating at its maximum capacity. The low-pressure cylinders are 50 in. in diameter with 14-in. diameter plungers and 48-in. stroke. Owing to the 24 hours service demanded of pump, all parts where possible were made interchangeable; through bolts were used in the water end, and special features were installed so as to make all necessary repairs in the shortest possible time.

The high- and low-pressure cylinders are connected in a manner to allow new piston rings to be placed on high- or low-pressure pistons without taking pistons off rods, or dismantling cylinders.

UNIQUE VALVE DESIGN

The water valves are of the double-beat type with valve seats of special bronze and valves of leather securely locked between two bronze plates. See section of valve chamber and valve, Fig. 2. The object of this design is to secure the greatest valve area with the minimum lift, thus permitting the pump to operate at maximum speed without undue pounding and excessive wear on valve and seat.

Entire water end of pump was wood lined so as to protect the cast iron from the action of the acidulous water.

The valves on steam end were located on the under side of steam cylinders, allowing complete drainage of condensation, or entrained water from the high- to low-

pressure cylinders and through the exhaust without danger to cylinder heads or pistons. These valves operate in removable cast-iron bushings with milled ports. With this arrangement and the adjustable rods on valve gear,

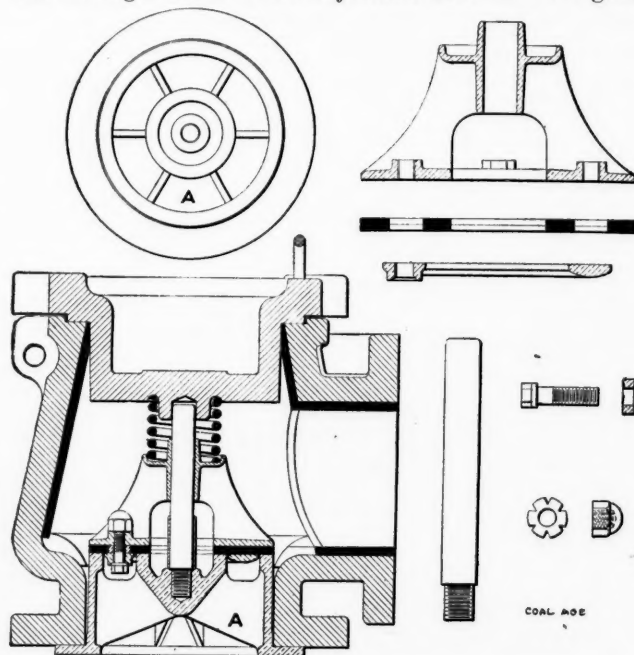


FIG. 2. SECTIONAL DRAWING OF VALVE CHAMBER AND VALVE

an accurate setting of steam valves can be accomplished.

Hand-hole plates were located on low-pressure cylinder heads to allow access to piston-rod nuts without removing the heavy low-pressure cylinder heads.

The cross stands are of the four-bearing type with long bronze bushed bearings and oil pockets of two-quart capacity, affording practically automatic lubrication of rockershafts.

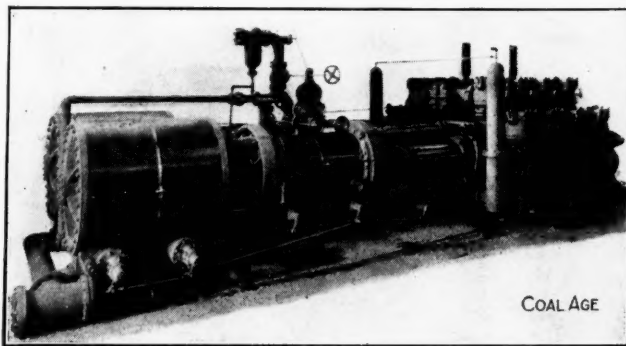


FIG. 3. A MAMMOTH, COMPOUND, CONDENSING MINE PUMP

This machine weighed 90 tons, and an idea of its size can be determined from the fact that it required a pump room 22 ft. wide, 65 ft. long, and 13 ft. high to accommodate pump and condenser.

The exhaust from low-pressure cylinders is taken care of by a single-cylinder independent air pump and jet condenser of the most improved type. Steam cylinder is 14 in. in diameter, air piston, 20 in. in diameter, and all of 24-in. stroke.

The steam end was arranged with special valve gear; the auxiliary slide valve of the "V" type, which insures against the valve not seating, and a double-ported steam chest to admit steam to chest piston, which in turn operates the main slide valve. This construction allows the proper cushion for chest piston and prevents slide valve from overtravel, thus absolutely guaranteeing full stroke and continuous operation of condenser. The air end was

of the sectional type, special for mine work so as to reduce repair expense, and save considerable time in replacing worn-out parts.

The air piston was of special bronze and arranged with a soft-rubber ring next to packing. This construction automatically takes up wear on packing and reduces the friction of packing on liner to an extent that the life of the packing and bronze liner is doubled.

The Principle of the Centrifugal Pump

BY J. D. CONE*

SYNOPSIS—The modern centrifugal pump can be made to perform practically any pumping duty common to coal mining. Its peculiar advantages are: simplicity, low-maintenance cost and its ready connection to the high-speed motor and steam turbine.

The advent of the high-head, high-efficiency centrifugal pump within the last 10 years has naturally resulted

A pump is a machine for transferring a fluid from one level to a higher level, or for increasing the pressure of a liquid. Both processes being, of course, the same, may, therefore, be performed with the same device, and simultaneously, if necessary.

A centrifugal pump, so called, is a device that uses centrifugal force to accomplish the above ends. Fig. 1 shows a cross-section of a Cameron two-stage centrifugal pump. The essential parts are the shaft *A*, revolved by

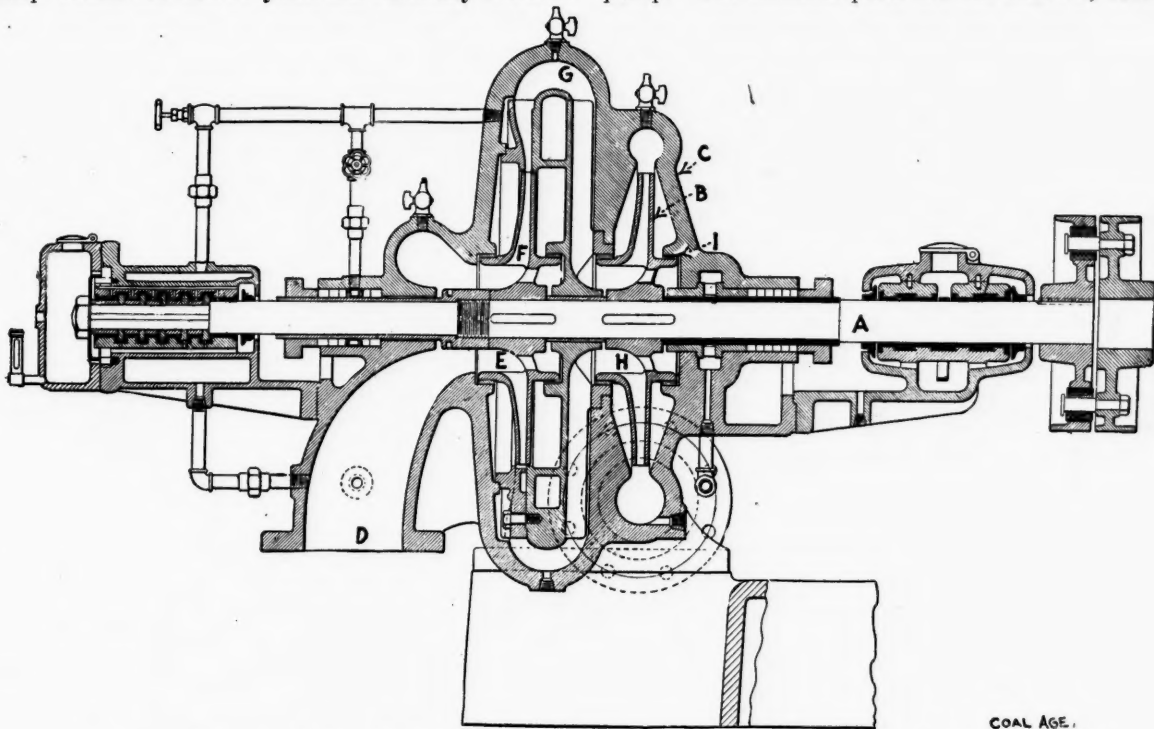


FIG. 1. CROSS-SECTION OF CAMERON TWO-STAGE CENTRIFUGAL PUMP

in considerable literature on the subject. The books available are of interest to the scientist, of some little value to the engineering student, but practically useless to all others. There are many practical men who have to buy, install or operate centrifugal pumps, who would like to go into the theory of the matter to some extent without being utterly befogged by a thick haze of higher mathematics. It is to these that I address my remarks and trust that within the limits of a brief magazine article, I can make quite clear the principles surrounding the operation of, what is after all, a very simple device.

*New York.

some external force; the impellers *B*, secured to the shaft and therefore revolved with it; and the casing *C*, in which both these parts operate. All the other parts are details and can be disregarded in the discussion of the principle of operation.

Water enters the pump at point *D*, called the suction inlet, and passes to the impeller, entering at points *E*. The impeller has curved radial passages *F*, leading from the hub to the periphery. As soon as the water enters the impeller, which is revolving at high speed, the centrifugal force available tends to increase the pressure of the water, and the increment is continuous until the water reaches the periphery of the impeller where cen-

trifugal force ceases to operate and the pressure is no longer increased through the action of this agency.

If water is allowed to pass continuously through the pump, the water in the impeller (being already under pressure) will be thrown off at a velocity dependent upon the peripheral velocity of the impeller. The water then exists under pressure and with a certain velocity. To be of use, this velocity energy must be converted into pressure energy and thus augment the pressure already produced by centrifugal force. This transformation of energy takes place after the water has left the impeller, the efficiency of the pump being largely dependent on the amount of loss that takes place during the change.

VELOCITY ENERGY IS CONVERTED INTO PRESSURE ENERGY

In the particular design which we are discussing, this conversion is accomplished efficiently by the use of what is called a diffusion ring. This is a ring entirely surrounding the periphery of the impeller and having at regular intervals a series of enlarging passages. These

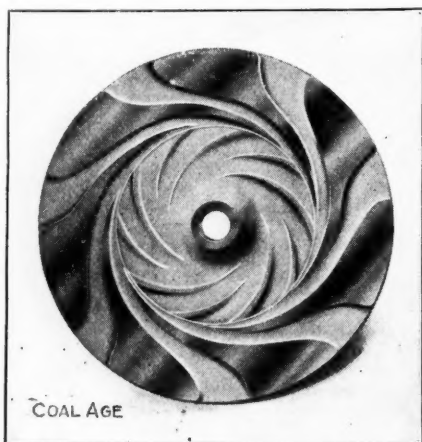


FIG. 2. SHOWING DIFFUSION RING

passages are quite small at the inner diameter and rapidly increase in area toward the external diameter; see Fig. 2. Water flows into the small end of these passages and, as the area rapidly increases, the velocity of the water is cut down proportionately and no appreciable work being done, the energy contained as velocity must appear in some other form, and does so as pressure.

The coöperation of the two forces above described is clearly shown by the use of the parallelogram of velocities given in Fig. 3. The line *CF* represents the velocity, and the relative direction of the water flowing through the impeller, the direction, of course, being that of the tip of the impeller vane. The line *PV* represents the velocity of the tip of the vane, and is, of course, tangential in direction.

Now, if we compound these two lines, we will get the intermediate line *AV*, which represents the actual velocity and direction of the water leaving the impeller. Then, by a very simple formula, the designer can conclude from the velocity just what pressure the pump can generate, or working backwards, as is usually the case, can design the machine to give certain definite results.

The pump shown in Fig. 1 is a two-stage machine, i.e., it is equipped with two impellers operating in series, the discharge from the first impeller leading through pas-

sages *G* into the suction *H* of the second, where the initial process is repeated and another increment of pressure obtained. By this construction practically any reasonable pressure can be secured, and pumps made in eight, ten or even twelve stages are not uncommon. It is usual to limit the pressure obtained in any one stage to about 90 lb.; and if a higher pressure is desired, add other stages.

WHAT IS MEANT BY "THRUST"?

No discussion of the centrifugal pump would be complete without some mention of thrust. Thrust is manifested, of course, in all centrifugal pumps. It is caused by unavoidable unbalanced areas at some point inside the pump and it operates to force the running parts violently to one side or the other, resulting in heating, wear and loss of efficiency, unless adequate means are provided to take care of it.

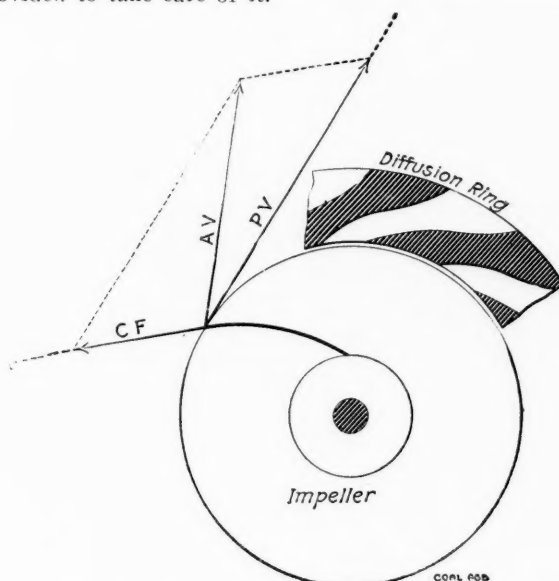


FIG. 3. PARALLELOGRAM OF VELOCITIES

In the particular pump under discussion, water enters *D* at atmospheric pressure (or less if water is being lifted), and the left-hand side of the impeller within the area of the rings *I* is, of course, under the same pressure. Now, the right-hand side of the same impeller is in more or less communication with the discharge pressure through the leakage which takes place past the wearing rings *I* (some leakage must be allowed here for lubrication), and is therefore practically subjected to the pressure generated in the first stage. This greater pressure on the right-hand side of the impeller acts toward the left and sets up thrust in a direction opposed to the direction of the incoming water.

To take care of this thrust it is usual to supply a marine thrust bearing, and the Cameron pump is so equipped. This is clearly shown at the left-hand end of the shaft. The thrust bearing consists of a series of babbit-lined grooves in a stationary cast-iron shell. In these grooves corresponding steel collars fit. They are mounted on and revolve with the shaft. It will readily be seen that this arrangement provides a series of shoulders which resist lateral movement, maintain the alignment of the impeller, and absorb any tendency to thrust.

Finally, a word as to efficiencies: As in all apparatus, efficiency is the ratio of output to input, and in the par-

ticular case of the centrifugal pump it is the ratio of water-horsepower, as represented by the discharge pressure and capacity, to the brake horsepower supplied to the pump shaft. This is known as pump efficiency. Sometimes overall efficiency is mentioned, and this comprehends the losses in the motive power also. In the case of an electrically driven pump, the overall efficiency would be the ratio of the water output to the watts delivered to the motor, both quantities, of course, being reduced to foot-pounds for purposes of comparison.

EFFICIENCY OF PUMPS

The efficiencies of the better class of pumps will run from 45 to 75 per cent., depending upon the size of the machine and the particular conditions under which the pump is to work. As a general rule, the high-head, high-speed, large-capacity pump will give the best efficiency.

In a pump having 70 per cent. efficiency, there will of course be 30 per cent. of losses, and these losses will be divided about as follows: Mechanical friction, 5 per cent.; hydraulic friction, 10 per cent.; leakage past the wearing rings, 5 per cent.; eddy currents or whirlpools, 10 per cent.

The field for the centrifugal pump is extending continually. There is hardly any pumping duty that cannot be performed efficiently by this splendid device, with its great simplicity, low maintenance cost, and ready connection to the high-speed motor and steam turbine.

We may expect within the next few years as the art of centrifugal-pump building advances to still further reduce the losses mentioned, thereby attaining still higher efficiencies.

Mining Suspension Opens with Large Stocks on Hand

Just previous to the suspension in 1912, COAL AGE reported market conditions as follows:

The tense feeling in the coal market continues unchanged. Consumers and producers are both keenly watching the results of the wage conferences, many of the larger interests having special representatives on the ground to insure reliable and prompt reports on the situation. It is purely a strike market and has been accepted as such by the trade, which is now playing a waiting game.

The movement to the Eastern markets continues to be only sufficient to meet current demands, and none of the companies are accumulating any surpluses. Prices are at the same high level, although they vary considerably with the reports on the labor situation. Water freights are somewhat lower and the railroad congestion is rapidly improving. In the Pittsburgh steam markets there is a disposition on the part of the consumers to shut down their plants rather than buy at the prevailing high prices.

In contrast with which the situation last week, Mar. 28, was reported as follows:

The coal year is closing with current business in anthracite at a complete standstill but a marked activity on negotiations for the new year.

On the eve of what appears to be a certain suspension in the principal bituminous coal districts of the country, the market continues relatively dull and listless. Some last-minute business has developed, causing a slight stiffening in prices, but, on the whole, the trade is far from what would normally be expected at this time. There is little confidence in the possibility of a long suspension and consumers seem to be well stocked for any emergency that may arise.

In Ohio, consumers, as a rule, refuse to be influenced by the possibility of a suspension, while the warm weather has caused a lull in the domestic business and dealers are endeavoring to clean up stocks rather than accumulate supplies. The railroads are beginning to accept lake coal, which may relieve the pressure.

The spot demand at Hampton Roads is light, the movement being confined almost entirely to contract; other West Virginia coals are dull and heavy, in spite of the near approach of the lake shipping season.

The general indifference of consumers to the possibility of a serious strike has created a great deal of uncertainty in the Middle Western markets. There has been some stocking, particularly on the part of the railroads, which has developed a hardening tendency in the market, but this is not by any means of notable proportions.

New Mine-Rescue Station

A station for mine-rescue car No. 4 of the government has been completed at Pittsburg, Kan., recently. The State of Kansas appropriated \$3500 for the structure. It contains trackage for the car and rooms for the men in charge, and possibly office room for State Mine Inspector Francis Keegan and his force of deputies.



NEW RESCUE STATION AT PITTSBURG, KANSAS

A spur of the Santa Fé R.R. enters the building. Much effort was expended in getting this edifice. It is in the center of the southeastern Kansas coal district and is only about 25 miles from the heart of the Joplin mineral district. Railroad facilities are excellent, the Frisco, the Missouri Pacific and the Kansas City Southern roads being ready with engines almost instantly to take the car out.

Acetylene Lamps in "Blackdamp"

BY JOHN MORRIS

Considerable interest has been aroused by Doctor Harger's proposal to charge the ventilating current of a mine with carbon dioxide as a means of preventing explosions. I have unfortunately had an experience of working in blackdamp with the aid of acetylene lamps, which in some respects goes far to prove the correctness of some of Doctor Harger's conclusions.

The adit level was the return airway of the colliery and also the drainage level, with the result that a considerable quantity of water ran through it. A fall occurred about 700 yd. from its mouth which banked up the water and completely stopped the ventilation. There was a small shaft about 250 yd. from the mouth of the adit level, the distance from this shaft to the fall being about 450 yd. It was found impossible to carry ordinary naked lights nearer than about 100 yd. from the fall, but an acetylene lamp would burn without trouble.

Note—Excerpt from paper on "Notes on Gobfires and Blackdamp," presented at meeting of the North of England Institute of Mining and Mechanical Engineers, Feb. 14, 1914.

After it had been made certain that the blackdamp had no appreciable effect on the men, several workmen using acetylene lamps were sent in to clear away the fall and work proceeded without interruption in relays. The blackdamp gradually gained until after the second day, a naked light was extinguished five yards inside the small shaft, but the gas appeared to have no ill effects upon the men, although they had to walk over a quarter mile to the fall through an atmosphere in which a match could not be struck. The acetylene lamps also burned as well as ever, and the men were able to work an 8-hr. shift.

The atmosphere gradually became worse until on the fifth day the acetylene lamps burned very dimly and even when a large flame was produced gave out very little light. At this stage some of the men complained of headache, although others did not feel any inconvenience, but all breathed heavily.

THE LAMPS BURNED DIMLY AND MEN SUFFERED FROM HEADACHE

Later on, the acetylene lamps began to go out, although placed so as to be quite steady and most of the men suffered from headache and smarting of the eyes, talked rather thickly, were somewhat unsteady and could not do any hard work. So long, however, as the acetylene lamps continued to burn at all, the men were quite capable of looking after themselves.

At this stage, it was interesting to watch the behavior of the acetylene lamps; even when increased in size the

flame, which had a bluish color, gave very little light, it stood at some distance, perhaps 2 in. above the burner, went up and down, and seemed to hunt about for air before it finally went out. Even at this extreme stage I did not feel much ill effect with the exception of a slight headache, smarting of the eyes, and a little deafness.

BLACKDAMP CAUSED DEAFNESS AND LACK OF CONTROL OVER LIMBS

Although the atmosphere was now such that the acetylene lamps would not burn,* I remained for about half an hour in the blackdamp in order to find out what the effects would be. Deafness became more pronounced, my limbs did not seem to respond to the will, and on moving about the legs seemed to go wherever they pleased; this was after five days' almost continuous living in the blackdamp. The ill effects disappeared very soon after getting into fresh air. Gob fires could not possibly exist in the atmosphere prevailing at this period, and explosions certainly could not happen, even if firedamp had been present. This experience goes far to prove Doctor Harger's contention that men can with impunity breathe an atmosphere which will not support combustion. I am firmly of the opinion that men could remain, without danger to themselves, in an atmosphere charged with blackdamp so long as acetylene lamps continued to burn.

*According to Dr. Harger, an acetylene lamp will go out when the percentage of oxygen left in the air has been reduced to 9.5. "Trans.," Inst. M. E., 1912, Vol. xliii, p. 132.



WHY NOT WORK ON THE FLOCK INSTEAD OF ON JUST TWO OR THREE?

The Development of Modern Types of Mine Pumps

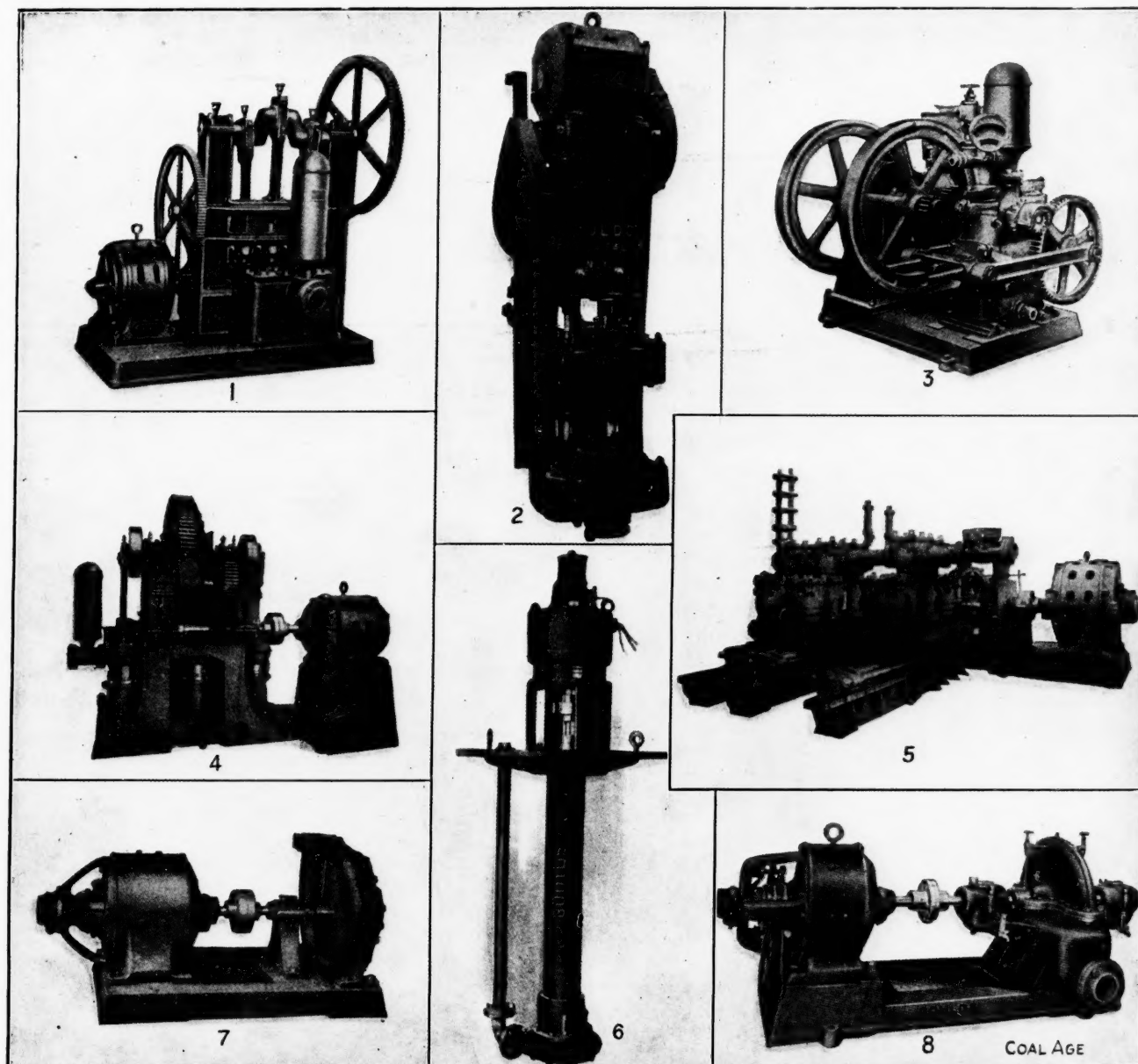
SYNOPSIS—Some notes on the gradual evolution of the modern drainage engine and a pictorial description of the different types.

One of the earliest attempts to unwater mines by means of power-operated pumps was made by Newcomen, in 1705. His was a simple bucket type of pump, connected by means of a long rod, to the walking beam of the Newcomen atmospheric engine. The subsequent invention of the steam engine by Watt lead to the development of the "Cornish" type of pump, consisting of a simple bucket, or plunger pump operated by the crank disk on the engine shaft. The "Cornish" pump was fairly efficient when the pump cylinder could be placed directly under the engine, but when the mine workings

extended in various directions from the original location of the engine the water ends were operated by means of long rods through bell cranks and the added friction of these working parts resulted in low efficiencies.

About 1860, the direct-connected steam pump was placed upon the market and being compact and easily moved from one mine to another, it was adopted almost universally. The steam boilers were, of course, on the surface and the long steam pipes, sometimes over 2000 ft. long, occasioned great loss of power. The heat of these pipes and the difficulty of disposing of the exhaust was another serious objection to this style of pump.

In the early '90's a new design of pump was brought out, known as the triplex power pump, driven by an electric motor. The compactness, simplicity and efficiency



DIFFERENT TYPES OF MODERN PUMPS USED IN COAL-MINING SERVICE

of this unit commanded instant recognition, particularly in the mining districts where the majority of the more important mines adopted it. The power pump requires from 50 to 75 per cent. less fuel than the direct-acting steam pump and its general use has been a big factor in the reduction of operating costs. During the past four or five years, centrifugal pumps have been designed, showing good efficiencies and their use in coal mines is becoming quite common, particularly in West Virginia and the Western fields.

Electrical-operated pumps have been designed to meet every condition in mines and a general description of the more common types are given herewith.

TYPES OF PUMPS

Fig. 1 shows a single-acting triplex portable mine pump, designed for pumping sumps and general emergency service. The capacities vary from 50 to 300 gal. per min. and it will pump against elevations of from 300 to 500 feet.

Fig. 2 shows a duplex, double-acting sinking pump. It is designed to be lowered in the shaft to pump from the bottom of the mine to the surface or to a station.

Fig. 3 shows a single-cylinder, double-acting piston

pump operated by a gasoline engine. It is built for capacities up to 100 gal. and for heads of 175 ft. It is light and portable and is used generally in the anthracite mines around Scranton, Pennsylvania.

Fig. 4 illustrates a motor-driven, single-acting triplex plunger pump, built for capacities up to 350 gal. per min. and heads up to 400 ft. This style of pump is used in small stations and also for boiler feed.

Fig. 5 shows a typical station pump. These are designed for capacities up to 2000 gal. per min. and heads up to 5000 ft. They are built primarily for mine service and the largest part of any of these pumps will go down in a shaft 3 ft. 6 in. square.

Fig. 6 illustrates a vertical centrifugal sump pump. Its capacities vary from 40 to 50 gal. per min., against from 40- to 50-ft. head.

Fig. 7 shows a motor-driven single-stage side-suction pump, with capacities from 40 to 200 gal., against an elevation of 100 ft. This style of pump has an impeller and is particularly adapted for handling dirty and gritty water.

Fig. 8 shows a motor-driven single-stage double-suction pump, built for capacities from 100 to 7200 gal. per min., against 150-ft. head.

Stripping a Mine by Hydraulic Methods

BY P. J. McAULIFFE*

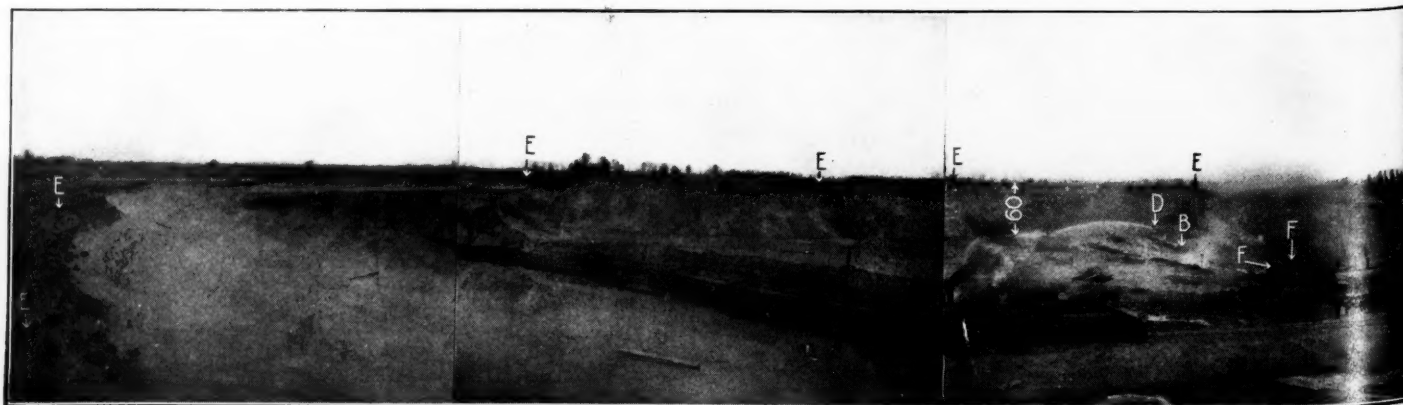
SYNOPSIS—Where the overburden is exceptionally tenacious, the steam-shovel method of stripping a mine is impractical. Under such conditions, a hydraulic plant, consisting of a water pump, hydraulic giant and sand pump, has been substituted with remarkable success and small expense.

At the Rowe mine, at Riverton, Minn., in a district where stripping by means of steam shovels has reached the high-water mark of efficiency, a hydraulic plant for removing the overburden has been installed and operated for a season with remarkable success, equalling, if not surpassing, the very best results of the steam shovels.

The material comprising the overburden, which aver-

ages about 54 ft. in depth, consists of sand, gravel and a gumbo clay, which is excessively sticky and tenacious; so much so that, after several attempts to handle it, steam shovels had to be abandoned, as, not only would the track work down out of sight under the shovels, but also at the dump. Even when the cars were lined with 2 ft. of straw the clay often would pull them down the dump with it, or else refuse to leave them at all unless pried loose and shoveled out.

The mine is adjacent to Little Rabbitt Lake, where the water pump, with a capacity of 3500 gal. per min., is placed. The water is pumped through about 1500 ft. of 12-in. pipe to the point chosen for excavation. Here the pipe is reduced and an ordinary hydraulic giant is fitted. The size of the giant nozzle is varied for the different ma-



PANORAMIC VIEW OF STRIP-PIT WHERE 64,000 CU.YD. OF MATERIAL

*Morris Machine Works, Baldwinsville, N. Y.

terials encountered, but for the average work a 4-in. nozzle is used. The water pressure at the nozzle is about 50 lb. The stream is directed against the bank and the material is washed down a rough channel to where a 12-in. Morris sand pump is located. The suction of the sand pump picks up this water and material and pumps it out through 12-in. pipe to the spoil bank. The discharge pipe of the sand pump varies in length during the season's work from 500 ft. to 1300 ft., with an average of about 1100 ft. The vertical distance from where the sand pump picks up its material to where it deposits it on the spoil bank is 27 feet.

It was found that the material brought down by the hydraulic giant would wash down to the sand pump on a grade as flat as 4 ft. in 100 ft. In other words, the sand pump could be permanently located in one place on a flat-boat or heavy skids while the giant could be worked all around the pump in a gradually increasing circle until this 4 in 100 slope ran out. In the above mentioned average depth of 54 ft., this limit would not be reached until the giant had swept a circle around the pump of 1350 ft. radius.

Compared to the constant moving of cars and tracks for a steam-shovel outfit, this is quite a saving. In all last season's work the location of the sand pump did not have to be changed.

Both pumps were driven by electric motors, the water pump being geared to motor and the sand pump being belt-driven.

This outfit handled on an average of 51,000 cu.yd. of material per month for the season's work, at a cost ranging from 5½c. to 7c. per cu.yd. This cost covers labor, operating expenses, upkeep and office expenses. The best month's performance was in December, when 64,000 cu.yd. were moved in 617 working hours with an average of 103.7 cu.yd. per hour.

The accompanying picture shows a panoramic view of the operation. The entire pit was excavated in five months by the above described plant. The steam shovel shown in picture made the excavation where the tracks are laid only. Here the orebody is reached and the steam shovel is necessary.

This hydraulic method of stripping has been so satisfactory to the mine owners that they have ordered two complete new outfits for the coming season's work. The new sand pumps are made of steel with all parts of extra-heavy proportions. They were built by the Morris Machine Works, of Baldwinsville, N. Y. Before the com-

ing season has passed the mine owners expect to have these sand pumps discharging through 2400 ft. of pipe against a 50-ft. static head.

List of Permitted Explosives, Canada

The list of explosives given below in the First Schedule is a complete table of the permitted explosives that have passed the new Rotherham test.

After Mar. 15, 1914, no explosives except those specified in the following schedules may be used or taken, for the purpose of use, into any mine in which the use of permitted explosives is required by the Explosives in Coal Mines Order of Sept. 1, 1913.

The use of the explosive named in the Second Schedule is permitted only for five years from Jan. 1, 1914, for the purpose of bringing down coal, in the class of mines defined in Clause 11 of the said order.

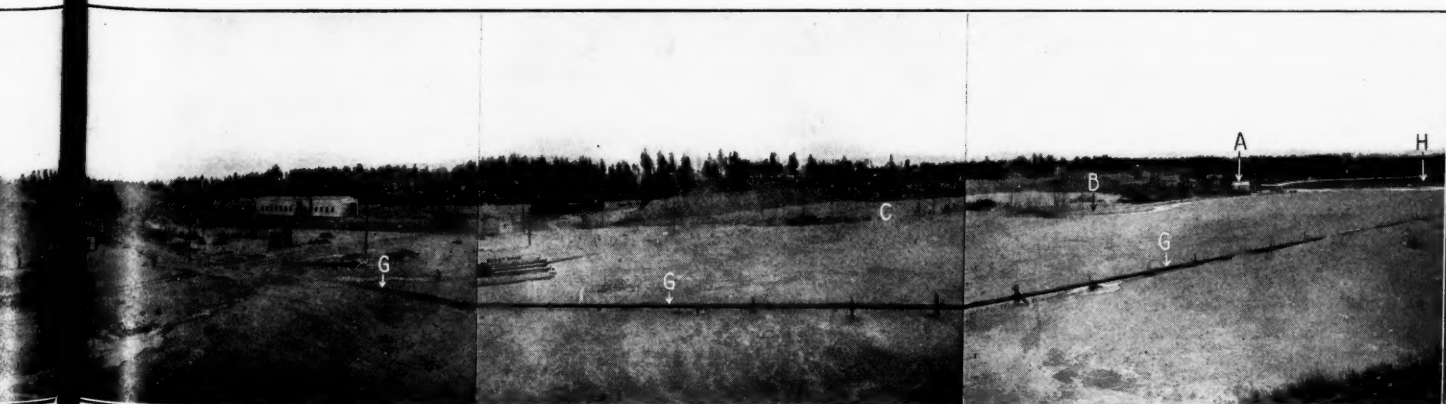
FIRST SCHEDULE

Explosive	Permissible Maximum Charge in Oz.	Pendulum Swing in In.*
Ajax powder.....	12	2.69
Ammonite No. 2.....	10	1.99
Ammonite No. 3.....	12	2.12
Bellite No. 2.....	32	2.42
Bellite No. 4.....	18	2.92
Britonite No. 2.....	24	2.26
Cambrite.....	30	1.98
Dreadnought powder.....	32	2.05
Dynobel.....	22	2.61
Essex powder.....	38	2.17
Expedite.....	32	2.62
Faversham powder No. 2.....	24	2.61
Haylite No. 1.....	10	2.18
Kent powder.....	32	2.01
Kentite.....	18	2.64
Kynarkite.....	20	2.21
Melling powder.....	12	2.62
Monarkite.....	26	2.67
Monobel No. 1.....	10	2.81
Negro powder No. 2.....	20	2.21
Neonal.....	16	2.56
New fortex.....	10	2.61
Nitro-densite.....	28	1.47
Permon powder.....	18	2.57
Pitrite No. 2.....	32	2.15
Pitsea powder No. 2.....	8	2.64
Sunderite.....	16	2.66
Super-excellite.....	10	2.74
Superite.....	10	2.53
Super-kolax.....	30	2.10
Swale powder.....	20	2.50
Syndite.....	40	2.22
Tutol No. 2.....	22	2.11
Uplees powder.....	16	2.64
Westfalite No. 3.....	12	2.55

SECOND SCHEDULE

Bobbinite

* This is the swing given to the ballistic pendulum, at the Home Office Testing Station, by firing at it a shot of 4 oz. of the explosive. It may be compared with the swing of 3.27 in. given by a shot of 4 oz. of gelignite containing 60 per cent. of nitroglycerin.



WAS HANDLED IN ONE MONTH BY EMPLOYING A HYDRAULIC PLANT

Electric Pumping at Tilmanstone Colliery*

SYNOPSIS—A detailed discussion of the construction, installation and operation of the electric pumping plant in use at the Tilmanstone Colliery, Dover, England; with an appended set of instructions for the switchboard and sinking-pump attendants.

The coal measures at Tilmanstone are directly overlaid by a sand bed 20 ft. thick, the latter being met with at a depth of 1150 ft., and proving to be heavily watered. It was decided to install three horizontal-type steam pumps, each having a capacity of 500 gal. per min., the water being admitted to the pump chambers through a series of boreholes, and the flow being controlled by a valve fitted to a safety-boring device.

The writer designed this safety-boring apparatus (Fig. 1), which consists of two tubes, sliding one within an-

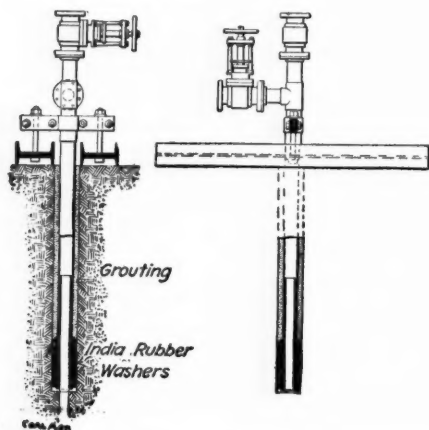


FIG. 1. SAFETY BORING APPARATUS USED AT TILMANSTONE COLLIERY

other, the lower ends being fitted with flanges turning outwards. By a series of india-rubber washers a water-tight joint is obtained. The upper end of the tubing is provided with a side tap and a through-way valve. The diameter of the borehole, to admit a 2½-in. bore-tube, was 4½ in., and this larger borehole was made specially for the reception of the boring apparatus. The boring apparatus was tested hydraulically to a pressure of 500 lb. per sq.in. Eventually, it was found that the volume of the feeder exceeded the capacity of the pumps installed, when it was decided to install electrically-operated pumps.

Figs. 2, 3 and 4 show the arrangements adopted for unwatering the shafts. A pump, inset with suitable waterway-ways and cable-ducts, was made at the 600-ft. level, and in it was installed a horizontal stationary Sulzer pump, direct-coupled to an A. E. G. three-phase-motor wound for 3000 volts, 50 periods. Two sinking pumps were suspended in the shaft on steel-wire ropes. The control of the fixed horizontal pump, and of two

sinking-pumps, was carried out from a switchboard, mounted in the 600-ft. pump-room, the switchboard consisting of 10 switch pillars built of sheet steel and totally enclosed.

Each sinking-pump motor was started by its own transformer, contained in a separate pillar, the adjoining pillar being provided with an oil switch, isolating lines and instrument transformers. The oil switch was also fitted with overload and no-volt releases (the latter being interlocked with the starting transformer), and further with an emergency stopping switch fixed on the frame of the sinking pump. Owing to these interlocking connections, it was impossible to close the motor oil switch unless the starting transformer was in the starting position, but in case of emergency, the motor could be stopped instantly by opening the emergency switch,

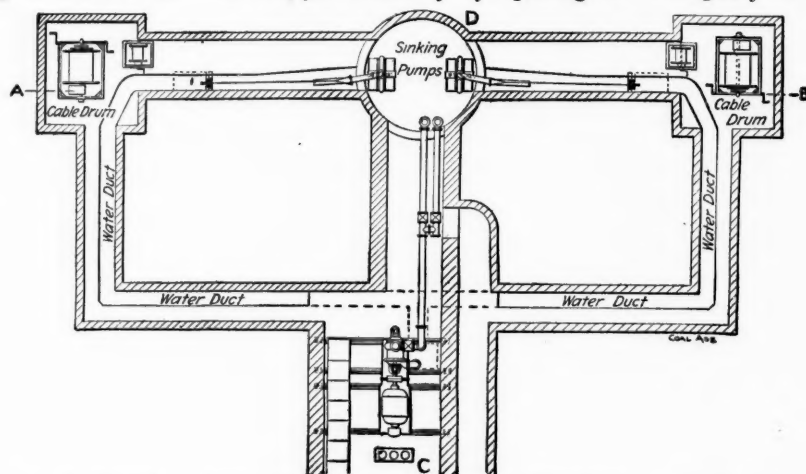


FIG. 2. GENERAL ARRANGEMENT OF ELECTRIC PUMPING PLANT AT THE 600-FT. INSET

fixed on the frame of the sinking pump. The breaking of the emergency switch trips the oil switch on the pump-room switchboard.

The cables for the sinking-pump motors were carried from the switchboard along the water ducts to the cable drums, connection to the latter being made through slip-rings mounted on the cable-drum shafts. The pilot cable, for stopping either sinking-pump motor, was also carried in a similar manner to a cable drum (see Figs. 2 and 3). The cable drums have steel-plate sides and laggings, and are mounted on shafts carried by strong angle-iron frames. Current was led through slip-rings fixed to the drum shaft, the slip-rings being totally enclosed in a cast-iron case. The high-tension sinking-pump cables were of the three-core rubber insulated and double steel-wire armoured type, each core having a sectional area of 1/10 sq.in. The armoring consisted of specially fine steel wire to render the cable thoroughly flexible. Each cable was connected to the pump motor by a suitable water-tight cable and box, the end of the cable being brought up from below with a view to preventing moisture finding its way into the cable box. Support for both the main and pilot cables was provided by clamps resting on, and bolted to, the main clamps, carry-

*From paper by Henry J. Wroe, presented at meeting of the London branch of the Association of Mining and Electrical Engineers, on Feb. 6, 1914. The Tilmanstone Colliery, of which Mr. Wroe is the manager, is owned by the East Kent Colliery Co., Ltd., and is situated at Eythorne, Dover, employing about 250 workmen.

ing the pipe column (see Fig. 5). A special feature of the clamp is the provision for liberating the cables without the necessity for removing the main-pipe clamps, and this arrangement proved a great advantage on several occasions.

The two sinking pumps, supplied by Mepis Sulzer Brothers, were of the centrifugal type arranged with vertical spindles. Each was capable of delivering 1200 gal. of water per min. against a maximum manometric head

of 870 ft., with four impellers. An injector operated by water from the delivery column was connected with the top of the pump casing from which is evacuated

any air taken in by the pump should be the latter be working "on snore." The oil wells for the bearings of the pumps and motors were water-jacketed, the water being taken from the first stage of the pump. Each sinking pump was coupled by means of an elastic coupling to a totally-enclosed three-phase squirrel-cage motor, each motor being capable of developing at 3000 volts, 50 cycles, a continuous output of 500 b.h.p. at a synchronous speed of 1500 r.p.m. The upper bearing of the motor carried the weight of the rotor, the weight of the pump shaft and impeller being taken by a step bearing on the pump.

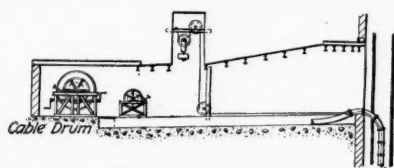
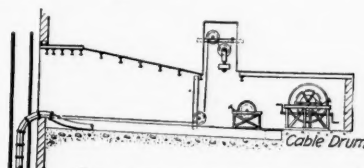


FIG. 3. SECTIONAL ELEVATION AB (FIG. 2)

facilitate the pipe-changing, two steam winches were fixed at bank, and these lowered the delivery pipes to the 600-ft. level, where they were added to the pipe columns as required. To counterbalance the weight, and to facilitate the taking-in of the hose pipe when a further length of steel piping was about to be put on, it was secured to a wire rope which passed round a series of pulleys, the inbye end of the rope being weighted, as shown in Fig. 3.



PUMPS AT 1140-Ft. INSET

A new pump inset was made from No. 3 Pit at the same level as

the steam pump room, viz: 1140 ft., and three electric pumps together with suitable switchgear were installed, as shown in Fig. 6. Each pump is of the horizontal stationary six-stage type, rated for a normal delivery of 1000 gal. of water per min. against a manometric head of 1300 ft. The guaranteed efficiency is 73 per cent. All

those parts which are liable to excessive wear, such as packing rings and packing bushes, are easily replaceable. These rings and bushes as well as the complete balancing device are made of hard bronze, the latter being armoured by hardened steel rings.

Each pump is mounted on a common bed plate, and is coupled direct by means of an elastic coupling to a three-phase-motor of the ventilated-enclosed type, capable of

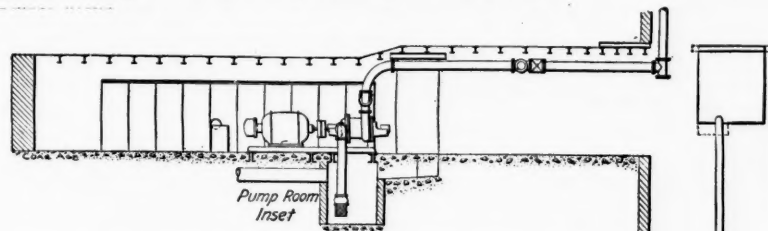


FIG. 4. SECTIONAL ELEVATION ON CD (FIG. 2)

The leading characteristic of the motor design is the combination of air and water cooling, the rotors being fitted with fans which equalised the temperature in the interior of the motor, and prevented the formation of heat pockets. The stated windings were water-jacketed, the cooling water being obtained from the first stage of the pump.

The pump, motor, pipes, clamps and cables are suspended on a 2-in. diameter flexible steel-wire rope of 6/37 construction having a steel-wire core. The rope passed from the drum to the winch engine over a headgear pulley, round the suspension pulley on the pump, and was brought back to the headgear where the end was secured by a strong capping. A separate steam winch was provided for each pump, each winch being capable of handling 40 tons (single purchase). Owing to the short lead of the ropes and to the heavy weight to be handled (the final load on each winch being 50 tons), it became necessary to make a traversing arrangement in order to prevent the ropes "copying" on the drum. This traversing gear is shown in Fig. 7. It consists of a massive cast-iron nut, carrying two rollers, the nut being moved to and fro by a strong screw operated by hand wheels, the rope passing between the rollers. In order to

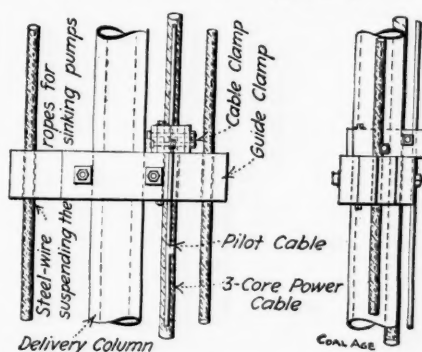


FIG. 5. GUIDE CLAMP AND CABLE-SUSPENDING CLAMP FOR SINKING PUMPS

developing at 300 volts, 50 cycles, a continuous output of 680 b.h.p. at a synchronous speed of 1500 r.p.m. The rotor has slip rings and brush raising and short circuiting gear. The motor is started by means of a liquid-starter provided with separately mounted protective resistances. The bearings

of pumps and motors are ring-lubricated, the bearings being water cooled.

Each pump is connected to the delivery piping through two valves arranged in series, one being the master valve which is always open, the other the gate valve used for controlling the pump-discharge. The foot valves are protected from excessive pressure by a device consisting of two flanges, between which is placed a thin piece of India rubber sheeting. The flanges are fitted to a short piece of tubing connected with the suction piping, and

if, for any reason, the pressure from the column comes on to the foot valve the india-rubber disc between the two flanges is broken before any further damage can be done. The pressure at the base of the delivery column is 520 lb. per sq.in. and it will be obvious that, should this pressure come on to the foot valve, damage either to the valve or to the flange on the suction side of the pump might result. The switchboard consists of three feeder panels, three motor panels, one spare motor panel, one transformer panel containing a 150 k.v.a. step-down transformer, and one transformer switch panel.

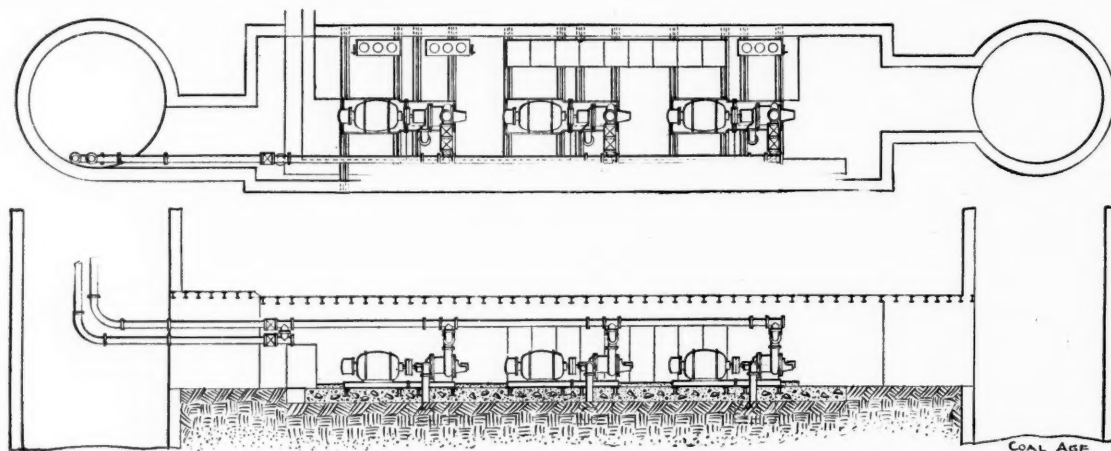


FIG. 6. ARRANGEMENT OF THE ELECTRIC PUMPING PLANT AT THE 1140-FT. INSET

When the coal measures were reached, the water was tubbed out of the shafts, and then the water conditions for the pumps improved very greatly. The quantity of water to be dealt with, has since fallen off very considerably, and arrangements are being made for altering the internal parts of the pumps, so that one pump will easily deal with the whole of the water made at this level. It may be mentioned that during the sinking and unwatering operations, which lasted ten months, not a single stoppage of the electricity supply occurred, and, further, that the sinking pumps and motors, in spite of

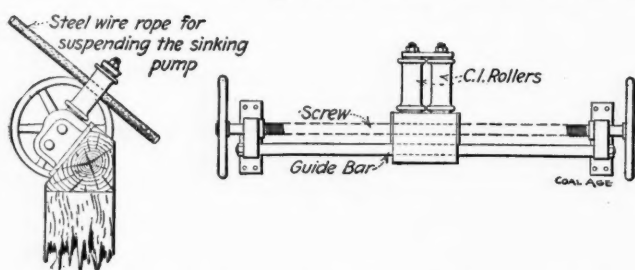


FIG. 7. ARRANGEMENT FOR GUIDING SINKING-PUMP SUSPENSION ROPES ON WINCH DRUMS

the onerous conditions under which they worked, were used alternately in such a way, that pumping was carried on continuously.

With a view to initiating the switchboard and sinking-pump attendants in their duties, and in order to obtain uniformity in the carrying out of the various operations, two sets of rules were drawn up—one for the switchboard attendant at the 600-ft. level, and the other for the use of the sinking-pump attendant. These rules are given in Appendixes I and II as follows:

APPENDIX I

Instructions for Operating Sinking-Pump Switchgear Before Starting Up

- (1) Before starting, inform power house by telephone.
- (2) See that the starting transformer is at the "off" position, and that the oil switch and isolating links are open.

Starting Up

- (3) Close isolating links. Close oil switch. Put starting transformer quickly in, but not beyond the "starting" position. Watch the ammeter; this will register about 200-250 amperes during starting. When the motor is up to speed, the amperes will fall suddenly to about 60 amps, when (but not before) the starting transformer must be thrown quickly into the "on" position. The gate valve on the pump may now be opened, when the current will increase.

- (4) If the motor should not come up to speed in less than a minute, switch off, first the oil switch, and then the isolating links, bringing starting transformer into "off" position, and report immediately by telephone to power house, asking them whether they are ready for another start. If the unsuccessful start is repeated, report immediately to power house, and await instructions.

Shutting Down

- (5) Inform power house by telephone. Close gate valve. Open oil switch. Open isolating links. Bring starting transformer into "off" position.
- (6) The motor should only be shut down from the pump by means of the emergency switch in case of real emergency, or when changing over, as given in next instruction.

Changing Over

- (7) When changing over from one pump to another inform power house. The working pump should be closed down as far as possible without actually shutting it down. The in-going pump is then to be started up in accordance with above instructions. When the in-going pump is up to speed and its gate valve opened, the out-going pump should be shut down by means of the emergency switch. When the out-going pump has stopped, put the emergency switch to the "on" position, thus leaving it ready for starting the pump motor again.

- (8) The amperes taken by either of the sinking pump motors, when pumping, must not exceed 82. If this is exceeded the inset attendant must take steps to inform the pump attendant, who must close the gate valve until the current has dropped to 82 amperes.

APPENDIX II

Instructions to Sinking Pump Attendants General

- (1) At the commencement, and at frequent intervals during each shift, the sinking-pump attendant must see that the two motor bearings and the pump-thrust bearing are properly lubricated, and that the bottom bearing under the pump is filled with Stauffer's lubricant.
- (2) The packing of the pump gland must be maintained in good condition to prevent air leakages.
- (3) The Stauffer lubricators on the pulley pedestals must be screwed up from time to time.
- (4) Every precaution must be taken to prevent damage to the cable boxes on the motors.
- (5) The pumps must be kept in a clean condition. Dirt and grease must on no account be allowed to accumulate.

(6) The temperature of the jacket of the motor must be observed frequently, and if the motor is found to be unduly warm, the matter must at once be reported.

(7) Any defect in the pumps, motors, cables, or other gear must be immediately reported to the manager or engineer.

Precautions Before Starting Up.

(1) See that the pilot switch is at the "on" position.

Special Note—If the pilot switch is not at the "on" position the pump cannot be started.

(2) See that the gate valve is closed.

(3) See that the strum of the suction is well under water.

(4) Fill the suction pipe and the pump with water from the delivery column, by opening the bypass of the gate valve, and the small valve on the filling piping. When the pump is being filled, the air cocks and the ejector valve must be open, to allow the air to escape from the pump.

(5) After the pump is filled, the air cock and ejector check valve must be closed, and the regulating cock of the cooling water pipe opened. The small valve of the filling piping, and the gate valve bypass, must remain in the same position they occupied when the pump was being filled. When filling the pump, the pressure gauge must be watched, and the bypass valve must only be slightly opened so that the foot valve is not damaged by excessive pressure.

(6) The pump must always be fully charged with water before starting up. If any air remains in the pump, the latter will not work properly, and will have to be shut down.

(7) The shaft coupling must be turned by hand to see that the pump and motor are quite free to rotate.

(8) The sinking-pump attendant must in every instance ascertain from the chargeman that the flexible hose is coupled to the delivery column at the 600-ft. inset before a signal is given to start the pump.

Starting the Pump

(1) The pilot switch must be at the "on" position.

(2) The gate valve must be closed.

(3) The pump must be filled with water.

(4) If one pump is running, its gate valve must be closed for an instant, and must then be opened three complete turns.

(5) Immediately before the signal to start is given, a final examination must be made to see that the in-going pump is full of water.

CODE OF SIGNALS—To start No. 1 pump: Knock 1 and then knock 3. To start No. 2 pump: Knock 2 and then knock 3.

(6) As soon as the in-going pump is up to speed, the oil-circulating system is working, and the cooling water is flowing properly, the gate valve of this pump may be slowly opened to its normal position.

(7) The bypass of the gate valve and the sluice valve of the filling pipe must then be closed.

(8) The gate valve of the out-going pump must then be closed, and the pump stopped by means of the pilot switch.

(9) In the event of the pilot switch failing to stop the pump, the following signals must be given: To stop No. 1 pump: Knock 1 and then knock 6. To stop No. 2 pump: Knock 2 and then knock 6.

(10) After a pump has been stopped, the pilot switch must be placed at the "on" position.

Note—The pilot switch must only be used for stopping the pump when changing over, as stated in the foregoing instructions, or when it is necessary to shut down the pump in case of real emergency.

If the gate valve is opened too wide, a larger quantity of water will be delivered, with the result that the motor will be overloaded.

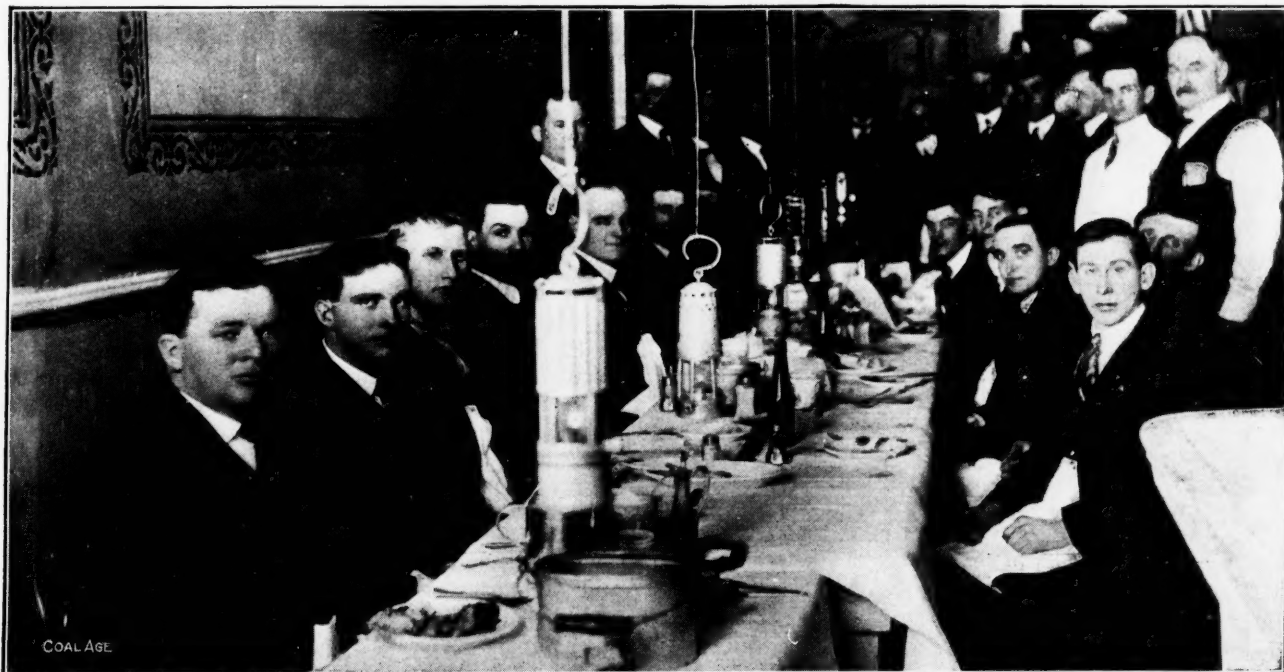
❧

A Laudable Work

The accompanying photograph of the members of the Coal Miners' Bureau of Research was taken at a banquet recently held at Johnston's Restaurant, Clarksburg, West Virginia.

The Coal Miners' Bureau of Research is an organization of mining men from the vicinity of Clarksburg, and although the membership is largely made up of mine foremen and superintendents, nevertheless there is a goodly representation of miners, inspectors, engineers and operators.

These men meet monthly in the Clarksburg offices of the Consolidation Coal Co. to discuss the many problems that confront them in performing their daily duties. "Safety First" is their slogan. The fact that every man is his brother's keeper has been taken to heart and they are doing what is in their power to safeguard the life, limb and health of their fellow-workmen. The individual views of those present are brought out and discussed. The members are enthusiastic. The organization is growing rapidly. They are doing a good work. May their tribe increase.



COAL-MINING MEN WHO ARE BOOSTING "SAFETY FIRST" IN WEST VIRGINIA

Methods of Weighing and Computing Mine Outputs

By NEILL HUTCHINGS*

SYNOPSIS—Inadequate weighing facilities are a prolific cause of labor troubles at many mines. Methods of eliminating these are discussed, and valuable notes are given on the accepted practice in computing production. Because of the varying factors due to washing, boiler consumption, etc., this latter is frequently difficult to arrive at.

✽

There are two main reasons for the weighing of coal: To compensate the miner fairly, and to arrive at the production accurately. The successful operation of a mine necessitates that the amount of coal mined by each miner be determined by weighing. The operator must have the confidence of the miners to the extent of having them feel that every care is taken to pay each one accurately. Nothing on the part of the miner is observed more closely than the weighing of his coal.

The miners will readily contribute a *pro rata* of their earnings to pay the salary of a check weighman, whom they should elect from their own number and whose duty it is to see that all cars are actually and carefully weighed by the company weighman. The employment of a check weighman by the miners should be readily conceded by every coal-mining concern, both as a means of verifying the correctness of the weights and as evidence that the company desires to pay every man all that he earns. Nothing will so quickly establish confidence between the company and the men, while lack of confidence in weights creates much friction and occasionally leads to serious trouble.

METHOD OF COMPENSATING THE MINER

The generally accepted plan of arriving at the tonnage of the individual miners is to furnish each man with a number on which to run coal. He is then supplied with brass checks bearing this number, one of which is placed on a hook inside of each car and near the bottom, so it cannot be taken out and another number substituted before it reaches the scales. In the case of cars which are dumped in rotary dumps, the hook must have a clip or spring, so the brass cannot fall out. At the time the car is dumped, the brass check must be removed and handed to the weighman. Right here it should be noted that it is important to have an honest check-puller, and some definite system of handling the checks. In many cases it is easy for a dishonest check-puller to work in collusion with two or three miners and substitute their checks for others when cars are dumped. The superintendent, weighman and check weighman should make it a point to look after the check-pulling carefully.

After the check is handed to the weighman, the weight of the car is recorded on the tally sheet under the number shown, and is then handed to the check weighman to be recorded on his sheet and hung on the check-board. It is suggested that the check-board be constructed so that it will swing in and out of a square opening cut in

the weigh shack. The checks are hung on the board inside the weigh house and at the close of each day's work the board is reversed so that the checks hang outside where the men can compare the number of checks on the board with the check weighman's copy of tally sheet posted thereon, without having to crowd inside. This arrangement also enables the men to get their checks as early as they like in the morning, as in many cases men go to work before the weighmen arrive.

PICK AND MACHINE MINING AND DOCKAGE

The company weighman and check weighman should make it a rule to balance their sheets at the close of each day's work and the number of checks hung on each numbered hook should agree with the number of cars credited each man on the tally sheet.

Brass checks are best in tallying coal, as leather checks, etc., are difficult to read after becoming soiled. The cost of brass checks is so small and their use so desirable for accurate reading and recording that most companies will find it a paying proposition to furnish them free to the miners and insist that no other kind will be recognized.

Both the company and check weighman should arrive at the mine early enough to see the men before they go in, as many questions arise, even under the best conditions, which the weighmen must be right on the job to take care of. This will save many a trip to the superintendent on the part of the men to secure adjustment and settlement of questions as to tonnage credited, etc. This results in real money saving to both the men and the company.

A distinction should be drawn between pick and machine numbers in mines where there are both, so that the tally sheets will show the amount of each in order that the rate may be properly applied. The best plan of doing this is to have the mine foreman or machine foreman, make up an additional daily report, showing the name and number of each man loading machine coal. This should be sent to the time office daily and checked with the tally sheet to see that the machine numbers agree.

In handling dockage the general plan should be to allow the miner credit for his full tonnage, and after the dockage report is looked over and passed on by the superintendent, to charge the miner with the amount. This plan is better than deducting the daily dockage from the daily tonnage because in many cases allowances are made on account of wet places, etc., which would necessitate refunds.

ARRIVING AT PRODUCTION

In selecting weighmen, care should be taken that only men who are honest and possess the faculty of treating men fairly and courteously be employed. Lack of tact and diplomacy on the part of weighmen, timekeepers and such employees is often responsible for the loss of good miners. The best place to head off trouble is at its source.

The production of a mine should not be considered as

*Accounting Department, T. C. I. & R.R. Co., Brown-Marx Bldg., Birmingham, Ala.

the total of the tipple weights, but is in fact the total tonnage of coal shipped, coked, used for plant purposes, etc. Shipments to market will usually be the largest item. The greater part of the coal will then be weighed in railroad cars over track scales. Where the product used for coking purposes is washed, this should be weighed before going to the ovens. It is desirable to compile monthly figures of the production of a mine in such a way that the total tipple weights will be exhibited in one place and the total inventory or production figures in another. This will show clearly any difference existing as the result of practice and methods pursued. These exhibits should be made up about as follows:

TIPPLE WEIGHTS	
Machine coal paid for	Tons (pay-roll figures)
Pick coal paid for	Tons
Dockage	Tons
Company coal	Tons
Total tipple weights	Tons
INVENTORY WEIGHTS	
Shipments to market	Tons (billing figures)
Dry coal to ovens	Tons
Dry coal to washer	Tons
Dry coal to boilers	Tons
Coal sold employees	Tons
Slate from picking tables	Tons
On hand	Tons
Total inventory weights	Tons

The item "On Hand" should exhibit the difference between the coal on hand in bins, railroad cars, etc., the first and last of each month. An increase over the previous month can be shown in black and decrease in red.

The tipple weights practically represent the coal paid for, so every concern will carefully scrutinize the total of tipple and inventory weights and endeavor to reconcile or find the cause of any existing differences. When tipple weights exceed inventory weights, the company will be paying for more coal than it is apparently getting. When inventory weights exceed tipple weights, the company is apparently not paying the men for all the coal produced.

The adjustment of differences in tipple and inventory weights must lie in a careful study of existing practices in handling and disposing of the product. At this point many factors arise affecting the final or inventory production of a mine. The product at some mines can be readily marketed without any treatment whatever. If the railroad cars are weighed correctly on track scales, these weights should agree very closely with the tipple weights. Thus the production of the mine is easily ascertained and any small differences can be easily reconciled.

DIFFICULTIES IN DETERMINING PRODUCTION

This desirable condition exists at but few mines. At most plants conditions have arisen in the manufacture of coke and the use of coal which necessitate the removal of certain natural elements and impurities by process of crushing, washing, etc. From coal considered as average grade, from 1 to 2 per cent. will sometimes be taken out in this manner. The dockage for this will, in few cases, amount to anything like 1 or 2 per cent. In a great many cases where coal washers are installed, the modern practice is to locate same in close proximity to the mine tipple in order to secure economic delivery from the tipple screens to the washer. In most cases slack is conveyed directly to the washer without weighing. In the process of washing, the slate is eliminated and the wet coal from the washer is either loaded in railroad cars or larries and after being weighed over track scales, is delivered to the ovens or shipped to market.

In figuring the production the tonnage of dry coal delivered to the washer must be known. If it is not weighed before delivery, this can only be figured by a backward

process, and in doing this several matters of importance must be considered. One is the amount of slate or refuse taken out of the coal in washing. Unless this can be weighed accurately, the best method of determining the amount is to load the refuse evenly in cars. A careful count of those must be kept and this can be multiplied by the cubical contents of the car in dry refuse to ascertain the total amount. This can be verified from time to time by independent tests. Another factor is that of moisture in washed coal. This must be determined by daily sampling and analysis.

In order to ascertain the amount of dry coal delivered from tipple screens to the washer, it is necessary to take the weight of washed coal loaded in railroad cars or larries, deduct the moisture and add the refuse. In cases where coal is delivered to the washer without being weighed, this is a very important factor in arriving at the production of a mine. It is easily seen that if the moisture or refuse figures are not right, the wrong amount of dry coal delivered to the washer will be obtained. Sometimes it will happen that enough fine coal is carried off in the discharge water from the washer to amount to several hundred tons a year. This is a feature not always considered in the monthly analysis of tipple and inventory weights.

Another vital factor in arriving at the production is the coal consumed at the boilers. In a great many cases coal is delivered to the boilers in mine cars and the tipple scale weights can be used. However, it is a common thing to find coal being delivered by means of conveyors, and in such cases it is rarely weighed and is difficult to estimate. There are good reasons in plenty why coal used for steam purposes should be weighed independent of the value of correct weights for figuring production. The knowledge of the weight of coal consumed is an important factor in working up the cost of steam and the boiler-horsepower-hours.

FACTORS AFFECTING PRODUCTION

It should be clear that the task of arriving at the final production figures for a coal mine embrace the consideration of several important factors and it is obvious that in practice every difference as between tipple and inventory weights cannot be explained clearly on account of the varying factors. Here are some points to be observed closely if the accuracy of production figures is desired:

Inspect and test tipple scales frequently.

Weigh sufficient empty mine cars once a month in the presence of a committee of miners to establish an average tare weight for mine cars.

Weigh all coal delivered boilers.

Weigh refuse from washers. (If possible, refuse should be loaded in railroad cars so track scale weights can be secured.)

Make frequent tests to determine the percentage of moisture in washed coal.

In conclusion, attention is called to a feature of great importance—that of the careful and commonsense weighing of coal over tipple scales. A mine tipple should be so arranged that the cars will slowly drift over the scales without being pushed. It is a common thing to see two or three tipplemen pushing cars over the scales. This naturally adds something to the weight of the car and if allowed for a considerable period the company will pay for something it does not get.

West Virginia Operators Appoint Safety Inspectors

SYNOPSIS—The recent action of certain West Virginia operators appointing safety inspectors for their mines, typifies the general growth of the "Safety-First" idea. A résumé of the duties of a safety inspector.

The "Safety-First" idea has been "taking hold" of late in a most gratifying manner. Popular sentiment finally has become aroused, and much is being said and written on the subject. But even more auspicious than this, is the fact that legislation, directed at the more adequate protection of life, is being both enacted and enforced.

A notable example of this latter was the sustaining, by the U. S. Supreme Court, of the Pennsylvania "Mine-Safety" law, requiring coal operators to leave standing pillars of coal to prevent cave-ins; in the test case of the Plymouth Coal Co. vs. David L. Davis, state mine inspector of Pennsylvania.

There are laws of a like intent in many other states; which is as it should be—for it is not only desirable, but necessary, that we have adequate legislation for the conservation of life and the protection of property.

Of even greater importance, from a practical standpoint, is the tendency of certain representative coal operators to "go on their own" in this respect. Initiative in the right direction is always commendable, and, in this connection, it is something more than that—it is conspicuous. In the past, the promulgation of the "Safety-First" idea has been too often left to lay editors, college professors and stump orators of a political ilk. Yet, even so, the seed was sown which was destined to achieve fruition in the brain of the operator.

A noteworthy example of this is seen in the recent action of certain operators in the West Virginia field, who voluntarily have appointed "safety inspectors" for their mines, in an effort to reduce accidents and fatalities, a splendid example for emulation. Moreover, these operators were not content in carrying out merely their personal obligations in this respect, they went further; they prepared a general letter, over their several signatures, which they forwarded to Earl A. Henry, Chief of the Department of Mines of West Virginia, wherein they outlined the duties of a "safety inspector," as they conceived them, and urged that he use his influence in securing similar action from all other operators in the state.

On receipt of this appeal, Mr. Henry mailed a copy of the letter to every coal operator in West Virginia, urging each to adopt similar provisions for the protection of the lives of those with whose safety they are charged.

Wherefore, let us accord all honor to these progressive and fair-minded operators, and to Chief Inspector Henry.

The letter, which deserves the careful consideration of all concerned, is reproduced below:

Dear Sir—This is to notify you that we have this day appointed a man to fill the position of safety inspector for our mines.

The object of this office is to add to the safety of our employees and the sole duties are to assist the mine foreman in regard to safety to employees.

The entire time must be spent in making inspections of the working places, haulways and traveling ways; he must see that the law is complied with in every respect and that the rules and regulations governing the operation of these mines are closely observed and adhered to, and he shall give all workmen instructions as to safety and safety-methods that are established and may be established in the future.

The following is a list of his duties in detail:

First: He must see that all persons going to and from work enter cars while stopped, that they sit down inside of cars and not up on the side, or on the bumpers, and that all persons remain inside of cars until they come to a dead stop, in no case must he allow persons to get on and off cars while in motion. See that the motormen engaged in hauling men trips use the proper care both as to speed and rough handling.

Second: See that no person carries any larger amount of powder or other explosives into the mine than the law permits.

Third: He shall visit all working places, at least every alternate day, and as much oftener as possible, see that they are in a safe working condition, that all loose coal, slate and rock is taken down, or securely propped, and that the coal is being blasted in accordance with law and rules governing the mine, and that a sufficient amount of air is in circulation, that break-throughs are properly driven, that the oil regulation is not violated, and that men do not carelessly handle powder or other explosives, and that props and caps and all necessary timber be kept up by the workmen and in no case allow them to take any risk for the want of timber; if the timber cannot be had, they must suspend work until same can be furnished. In the event he finds a person working under loose coal, slate or rock, he shall stay with him until same is made safe. Start a system of setting timbers in rooms, the maximum distance apart shall be 3½ ft. and as much closer as the nature of the roof may require; a standard distance of 12 in. from the rail is required, and all posts must be set in the best position to support the roof, which position is most generally at right angles to the weight or roof.

Fourth: He shall examine the roof along the haulways and traveling ways and mark all loose slate to be taken down, and when, in his judgment, he deems it unsafe to wait until after working hours to have it removed, he must have it removed at once, regardless of cost. In no case must he permit any person to work in an unsafe place, except for the purpose of making it safe, and in case it is extra hazardous he shall remain with the workmen until same is made safe.

Fifth: He shall make a daily report of his inspections in a book which is to be kept in the office of the mine superintendent for his examination. He shall be subordinate to the superintendent and keep him informed of any violations of the rules and of his inability to comply with the law or rules, by lack of material of any kind. His daily reports shall consist of the condition of the various working places he visits, violation of the rules and law, by whom, when, where and how, steps taken to remedy same. If any person or persons shall try to intimidate him in the discharge of his duties, state same in his daily report, give name and nature of the offense, and said person shall be dealt with severely.

Sixth: It shall be his duty to see that all stretchers, blankets, etc., are kept in readiness, and that same are returned to their places after being used. He shall include this in his report. A medicine chest with bandages, plaster, cotton, tourniquet, splints and other appliances to render first aid will be in the mine superintendent's office for use in case of emergency. He will be given a key to said office.

Kentucky Mining Institute Meeting

The annual meeting of the Kentucky Mining Institute will be held in Lexington, Ky., again this year on May 8 and 9. A special feature of the meeting will be the state-wide first-aid contest, in which a number of first-aid teams from the various mining companies will participate.

As an attraction for the first day's meeting, it is hoped that the Federal Bureau of Mines will place its immense explosion gallery in Lexington for a demonstration of the explosibility of coal dust, and the dangers of blasting coal with black powder in the presence of dry coal dust.

It is proposed to have a mining show during the meeting, and Secretary Cramer has asked a number of manufacturers to send exhibits for this purpose.

Great Britain is estimated to have a reserve of 189,534,000,000 metric tons of coal, most of it bituminous, while France has 17,584,000,000, also chiefly bituminous. Germany's actual reserve is 94,865,000,000 tons of bituminous and 9,314,000,000 of brown coal, though it is probable that there is a large further reserve.

Agreement to End Strike

SYNOPSIS—A satisfactory and equitable agreement drawn by the company officials in consultation with a duly authorized committee of their employees, which agreement is to remain in force for two years and seven months and has been ratified by vote of the men.

We give below the full text of the agreement entered into early last month between the Western Fuel Co., Nanaimo, B. C., Can., and its employees. The agreement is for a term of three years and its provisions are said to be eminently satisfactory to all parties concerned, and such as will tend to guarantee peace and harmony in the Island of Vancouver, it is hoped, for years to come.

Although the agreement concerns only the underground men, the Western Fuel Co., in keeping with their general practice of looking after the welfare of all their employees, are revising the wage scale of the men employed on the surface, such revision to take effect from the date of the agreement with the underground employees.

In addition to the general agreement, which formed the basis of the settlement of the strike conditions, an insurance scheme has been adopted as a result of the unanimous vote of the men ratifying the agreement, at one of their mass meetings. The insurance plan is appended as a supplementary agreement to the main contract. The full text of this insurance plan and agreement is given below:

Memorandum of Agreement entered into this sixth day of March, 1914, between the Western Fuel Co., hereinafter called "The Company," party of the first part and the employees of the Western Fuel Co., represented by an Agreement Committee, elected at a duly called mass meeting, held Feb. 18, 1914, party of the second part:

Witnesseth—That, for and in consideration of the several conditions hereinafter mentioned and the mutual advantages of both parties, it is agreed by and between the parties hereto, as follows:

1. The rates, terms and conditions in effect at both No. 1 and Northfield Mines, during the month of April, 1913, shall continue in effect during the term of this agreement, except as hereinafter provided.

2. The company agrees to pay all employees covered by this agreement a bonus of 10 per cent. during the term of this agreement; being an addition of ten (10) per cent. to all rates and wages herein specified.

3. The company shall absorb the expense of operating the Protection Ferry.

4. The system of dockage inspection, as practiced at both No. 1 and Northfield Mines shall be continued, with penalties for refuse matter as follows:

No. 1 Mine—Up to and including 50 lb. of refuse per car, double dockage. Over 50 lb. and including 100 lb. of refuse per car, confiscation of car. Over 100 lb. of refuse per car, dismissal after investigation.

Northfield Mine—Up to and including 70 lb. of refuse per car, double dockage. Over 70 lb. and including 140 lb. of refuse per car, confiscation of car. Over 140 lb. of refuse per car, dismissal after investigation.

Provided that any party dismissed may have the right of appeal to the superintendent of mines, whose decision shall be final.

5. The company agrees to a minimum rate of three dollars and fifteen cents (\$3.15) per shift, for miners in the lower-seam workings of No. 1 and Northfield Mines. It is understood that the superintendent of mines shall be the judge as to the ability of the party to earn such minimum rate.

6. The company agrees that when a miner is taken from the face to perform daywork he shall receive the miner's day rate.

7. The schedule for loading coal shall be as follows: Upper seam, 30c. per ton; lower seam, 35c. per ton; and for using buggies and laying roads at:

No. 1 Mine—First 75 ft. from dump to face line, five (5) cents per ton additional.

Second 75 ft. from dump to face line, ten (10) cents per ton additional.

Northfield Mine—First 50 ft. from dump to face line, five (5) cents per ton additional.

Second 50 ft. from dump to face line, ten (10) cents per ton additional.

Third 50 ft. from dump to face line, fifteen (15) cents per ton additional.

8. The schedule for rock in coal of upper seam shall be as follows: When rock is 1 ft. thick, \$1 per yd. When rock is 2 ft. thick, \$2.40 per yd. When rock is 3 ft. thick, \$4 per yd. Above schedule applies only to solid work in stalls. Skip-ping pillars take one-half of these rates.

9. The schedule for timbers to be as follows: String rs, 50c. each when 8 ft. long and under; \$1 each when over 8 ft. long. Sets, \$1.50 each for 9-ft. collars; \$2 each for 11-ft. 4-in. collars.

10. The mining, yardage and day rates for No. 1 Mine shall be as shown on Schedule "A," hereto attached and which schedule is made part of this agreement.

11. The mining, yardage and day rates for Northfield Mine shall be as shown on Schedule "B," hereto attached, and which schedule is made part of this agreement.

12. The agreement committee shall consist of three members representing No. 1 Mine, two members representing Northfield Mine and two members representing any new mine operated by the company, after the new mine has been placed on an operating basis.

The company agrees to meet the agreement committee, or a subcommittee thereof, on matters relating to this agreement or any new matters changing the status thereof, or to adjust any matters in dispute between the employees and mine officials; it being distinctly understood that there shall not be any stoppage of work by employees, individually or collectively, pending the hearing of and adjustment of any dispute or grievance during the term of this agreement.

Any vacancy on the agreement committee is to be filled at a duly called mass meeting of the underground employees of the company, or by a pit-head ballot at the mine from which the vacancy exists.

The agreement committee to have the handling of the checkweighmen and gas committee funds.

13. The term and duration of this agreement shall be for a period of two years and seven months, beginning Mar. 1, 1914, and terminating Sept. 30, 1916; and during the month of August, 1916, a mass meeting of the underground employees shall be held to elect a new agreement committee to negotiate a new working agreement, said meeting to be called by the chairman and secretary of the existing agreement committee.

14. This agreement shall be binding upon and respected by the company and its successors, and also shall be binding upon and respected by all employees, who before accepting employment shall endorse this agreement, by their signature in a book containing a copy of this agreement and kept in the company's office: PROVIDED that all employees working for the company at the time of the execution of this agreement and who continue to work for the company shall, by such action, be understood as agreeing to and endorsing all the terms and conditions of this agreement.

15. The day rates applying to No. 1 Mine, and the contract rates applying to the south side of No. 1 Mine, shall apply to and govern all classes of underground work at the new Reserve Mine, when that mine is placed upon an operating basis, and shall continue as the rates for that mine during the term of this agreement unless changed by mutual agreement.

The Reserve Mine when placed upon an operating basis shall have a representation of two members upon the agreement committee, who shall be elected by a pit-head ballot at the mine.

16. This agreement to be effective shall bear the signatures of the manager and superintendent of mines for the company, and the agreement committee for the employees, and the approval signature of the president of the company.

SIGNED, SEALED AND DELIVERED, the day and year first above mentioned.

FOR THE COMPANY—

THOS. R. STOCKETT, Manager.
JOHN HUNT, Superintendent.

FOR THE EMPLOYEES—

JOSHUA NORRIS,
JAMES H. ROBERTSON,
ANDREW THOMSON,
JOSEPH DEAN.

On behalf of the men,

JAMES MILLER, Chairman.

SCHEDULE "A"

Mining, Yardage and Day Rates—No. 1 Mine

Mining—Upper seam, per ton, 68c.; lower seam, per ton, 80c.

Yardage, Upper Seam—Levels, \$2.50 per yd. and coal. Crosscuts, \$2 per yd. and coal. Levels, when less than one-half of height is in white rock, \$7.50 per yd., coal to company. Levels when more than one-half of height is in white rock \$8 per yd., coal to company. Turning stalls, 5 yd. long by 12 ft. wide, \$10 and coal.

Day Rates—Fireboss, \$3.65; shotlighter, \$3.40; face men, \$3.20; bratticemen, \$2.85 to \$3.15; timbermen, \$3.15; timbermen helpers, \$2.75; tracklayers, \$2.85 to \$3.15; tracklayers' helpers, \$2.75; roadmen, \$2.75; drivers, boss, \$3.25; drivers, double, \$3; drivers, single, \$2.87½; drivers, boys, \$1.60 to \$2.40; pushers, \$2.75; linemen, \$3.10; motormen, \$2.87½; motormen assistants, \$1.60 to \$2.40; engineers, diagonal slope, \$2.85 to \$3.15; engineers, endless rope, \$2.75; winch drivers, \$1.10 to \$2.75; rope inspector, \$3.15; endless ropes, men, \$2.75 to \$2.90; endless ropes, boys, \$1.35 to \$1.90; rope riders, \$1.60 to \$2.75; doorboys, \$1.10; cager, head, \$3.15; cager, assistants, \$2.75; miners, \$3.15; loaders, \$2.75; machine foremen, \$3.70; machine runners, 1st class, \$3.65; machine runners, 2d class, \$3.25; machine runners, 3rd class, \$3; machine runners, helpers, \$2.75; drillers, 1st class, \$3.65; drillers, 2d class, \$3.25; drillers, 3rd class, \$3; muckers, \$2.75; brushers, \$2.80; cogmen, \$2.75; laborers, \$2.75; pipemen, \$2.75 to \$3.10; pumpmen, \$2.75 to \$2.85; stablemen, \$2.85.

SCHEDULE "B"

Mining, Yardage, and Day Rates—Northfield Mine

Mining—Upper seam, per ton, 68c.; lower seam, per ton, 80c.

Yardage, Upper Seam—Levels, \$2.50 per yard and coal. Crosscuts, \$2 per yd. and coal. Levels, when less than one-half of height is in white rock, \$7.50 per yd., coal to company. Levels, when more than one-half of height is in white rock, \$8 per yd., coal to company. Turning stalls, 5 yd. long by 12 ft. wide, \$10 and coal.

Day Rates—Fireboss, \$3.65; shotlighter, \$3.40; facemen, \$3.20; bratticemen, \$2.85; timbermen, \$3.15; timbermen helpers, \$2.75; tracklayers, \$2.85 to \$3.15; tracklayers' helpers, \$2.75; drivers, boss, \$3.25; drivers, double, \$3; drivers, single, \$2.87½; drivers, boys, \$1.60 to \$2.40; pushers, \$2.75; rope inspector, \$3.15; endless ropes, \$2.40 to \$2.90; rope riders, \$1.60 to \$2.75; winch drivers, \$1.10 to \$1.60; doorboys, \$1.10; cager, \$2.90; miners, \$3.15; loaders, \$2.75; machine foremen, \$3.65; machine runners, 1st class, \$3.65; machine runners, 2d class, \$3.25; machine runners, 3d class, \$3; machine runners, helpers, \$2.75; drillers, 1st class, \$3.65; drillers, 2d class, \$3.25; drillers, 3rd class, \$3; muckers, \$2.75; brushers, \$2.80; cogmen, \$2.75; laborers, \$2.75; pipemen, \$2.75 to \$3.15; pumpmen, \$2.75; roadmen, \$2.75.

Supplement to Agreement dated the sixth day of March, 1914, between the Western Fuel Co. and its employees represented by the agreement committee:

A It is agreed that in the event of a fatal accident occurring in the mines, or in event of a death resulting from injuries received in the mines, that the operation of the mine in which the accident occurred shall not be suspended on the day of the funeral of the deceased party, but that any employee wishing to absent himself from work for the purpose of attending the funeral shall have the privilege of doing so.

All employees working on the morning, afternoon and night shifts of the day of the funeral agree to contribute the sum of one dollar (\$1) per man and fifty cents (50c.) per boy, to a fund to be given to the nearest relative of the deceased party.

The company agrees to duplicate the sum contributed by the employees.

For the purposes of this section all employees whose daily wage is less than three dollars (\$3) per shift shall be considered as boys.

The company is authorized to make collections for this fund from the payroll of its employees in manner similar to other collections.

Nothing in this section shall relieve the company of any obligation under the Workmen's Compensation Act, nor shall it relieve the employees of their obligation to the Medical Relief and Accident Fund.

B It is agreed that monthly meetings of the management

of the company and the agreement committee shall be held on the first Wednesday of each month at two o'clock in the afternoon at the company's general office.

Special meetings may be called at any time by the management of the company or the chairman of the committee, due notice of such meeting to be given to all parties.

SIGNED, SEALED AND DELIVERED, the sixth day of March, 1914.

FOR THE COMPANY—

THOS. R. STOCKETT, Manager.
JOHN HUNT, Superintendent.

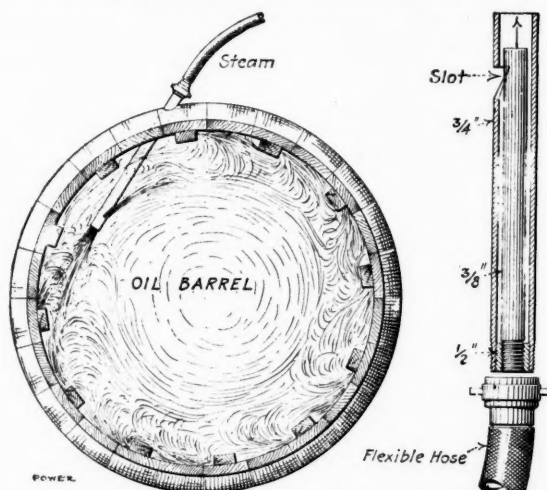
FOR THE EMPLOYEES—

JOSHUA NORRIS,
JAMES H. ROBERTSON,
ANDREW THOMSON,
JOSEPH DEAN, Secretary.
JAMES MILLER, Chairman.

Steam Washer for Cleaning Overalls

The accompanying sketches show an arrangement a fireman made for washing overalls after considerable experimenting with several similar ideas, none of which was so satisfactory as this.

The outfit as shown consists of a barrel with an injector-like apparatus which may be connected to a steam



PLAN OF WASHER AND SECTION OF NOZZLE

main through a flexible hose connection. Around the sides of the barrel is a series of vertical slats to break up the steady rotation of the water which the injector action gives and to set up counter-current, so that the clothes to be washed are thoroughly agitated.

The barrel is an ordinary oil barrel; the injector was built up of three standard sizes of pipe assembled as shown in the sketch—Power.

Canadian Coal Production

The estimate of John McLeish, chief of the Division of Mineral Resources and Statistics, for Canada, shows the production of coal in the Dominion in 1913, and the revised figures for 1912, to be as follows:

	1913	1912
Nova Scotia.....	7,972,727	7,783,888
British Columbia.....	2,714,440	3,208,997
Alberta.....	4,144,377	3,240,577
Saskatchewan.....	209,175	225,342
New Brunswick.....	70,311	44,780
Yukon Territory.....	4,050	9,245

Total for Canada..... 15,115,089 14,512,829

The output in 1913 was unfavorably affected by labor troubles in Vancouver Island, British Columbia.

Editorials

One Way to Advance Loyalty and Efficiency

The greatest problem of industrial life today is the task of effecting a proper relationship between employer and employee. If satisfactory results are to be obtained in the way of loyalty and efficiency, the workman must be encouraged to have confidence in his superiors.

In furtherance of this end, it is an excellent suggestion that the president, or whoever is the supreme official of each corporation, invite every man in his employ to communicate directly with him, by personal interview or letter, whenever real occasion arises. Nothing is better calculated to foster this feeling of confidence on the part of an employee than the certain knowledge that his ideas, suggestions and complaints will receive the personal attention of the man-at-the-top without first going through the hands of subordinates. Most workingmen have confidence in the "big boss." On the other hand, they are sure to have a feeling of distrust for the small understudy. And this condition is not without cause, for it often occurs that petty officials endeavor to advance themselves in the eyes of their superiors by presenting suggestions from the men under them as their own original ideas.

It will be claimed by some that a plan built on the lines here suggested would be destructive of discipline. This is not true, as has been proved by the successful adoption of such a system at several of the largest industrial plants in America. Great good is sure to result when the workingman is brought to feel that the highest official of his corporation is taking a personal interest in him and is ready to discuss proposals for company betterment with him man-to-man.

The Western Fuel Co. Agreement

The Western Fuel Co., Nanaimo, B. C., Can., and Thomas R. Stockett, the genial and efficient manager of the company, are to be congratulated on the agreement entered into between the company and its employees. This agreement is the culmination of the strike difficulties that have existed in Vancouver Island during the past 18 months.

The trouble arose from the attempt of the United Mine Workers of America to extend their organization and influence into British Columbia. Agitators were sent into the Island of Vancouver to arouse the interest of the miners in the Island and enroll them as members of the organization. These efforts met with indifferent success, owing primarily to the fact that the Vancouver miners were working under conditions with which they were generally satisfied.

According to the evidence that developed on the investigation of mining conditions in the Island, by the government, a general walkout that was in effect equivalent

to a strike, was brought about by the strategy of inducing the miners to vote a "holiday," after which coercive measures were used to prevent the return to the mines of those men who were willing and desired to work.

In this case, as in a number of other similar instances, elsewhere, the broad principle was overlooked by the strike makers that, *Every man has a right to work without interference or intimidation by other workers of a different mind.* No argument is needed to emphasize or explain this *right of the individual.* It is the foundation principle of all industry. Any curtailment of the *right to labor* is contrary to the law of self-support and good government, and its advocacy by any individual or organization is evidence in itself of *lawlessness.*

The manner in which mining operations have been conducted in the Island during this period of disturbance is greatly to the credit of the management of the coal companies, not a little credit being also due the large majority of the men, for their loyalty to their employers. It can be truthfully said that few companies have done more than the Western Fuel Co. to improve the conditions in and around their mines, and to encourage the spirit of coöperation among the workers. These efforts on the part of the company have been fully appreciated by the majority of their employees, who resisted, to the extent of their power, the unjust interference of the few with the operation of the mines.

We give in another place the full text of the agreement of Mar. 6, 1914, which is to extend over a period of three years.

Coal Buying on a Large Scale

In the recent request for bids involving 640,000,000 lb. of coal per annum to supply the state of New York with fuel, a new and commendable precedent in coal purchasing has been established. Obviously, a deal of this magnitude will enable the bidder to compute his profit at the lowest conceivable margin, much to the benefit of the purchaser.

While this is, of course the predominating reason for this new departure, it will probably develop eventually that the scheme has other and even more important advantages. For instance, under the present system of coal buying, each institution acts on its own initiative without expert advice of any kind. In many instances, the medical officers at the state institutions are called upon to decide their own fuel problems, while in general the question is seldom or never handled by really competent men.

Under the new arrangement, the state will derive the benefit naturally to be expected from the best services available. A special commission, made up entirely of fuel experts, will study the different problems in all their ramifications and select the fuel best adapted to the requirements of the individual plants. It may even eventually develop that the economy in consumption this commission is able to effect will be of even greater importance than the amount saved in buying.

That the buying is to be done entirely on the B.t.u. basis will be construed as an important recommendation of this system by its advocates. However, it is possible that a deal of this character, offering such opportunities for favoritism, could only be handled in this manner. The specifications drawn up by the commission are essentially practical and contain but few points with which the responsible bidder could take issue. From a cursory examination of them, the most objectionable feature seems to lie in the proposed schedule of payments which provide for much longer delays than is prescribed by the rules of good business or that the operators in general would ordinarily consider. But since the obligations of a commonwealth such as New York are readily negotiable at a minimum discount, this feature is insignificant.

Stone-Dust Stoppings

In an inquiry published in the last issue of COAL AGE, March 28, p. 539, the question was raised as to the feasibility of building what might be called "stone-dust stoppings," consisting of two walls of slate or rock, with the intervening space filled with fine stone dust. The argument advanced in favor of this suggestion was that, in case of an explosion, and the destruction of the stopping by the force of the blast, the stone dust would be thrown into suspension in the air, at the moment and at the place most needed to arrest the explosive wave.

We believe that this suggestion is worthy of consideration. The efficacy of stone dust to stop the progress of an explosion in underground passageways has not as yet been thoroughly tested. Many experiments seem to indicate that this is an effective method of destroying the explosive condition of mine air. We believe that more attention should be given to the matter of applying this principle in coal mining.

At the present time, it is common practice, in many mining districts, to build road stoppings by erecting a double wall of slate and filling the intervening space with road dust. This dust, however, is largely contaminated with fine coal dust and is to that extent combustible and dangerous to be used for the filling of stoppings. The question to be decided is: Is stone dust sufficiently efficacious in arresting the explosive wave to warrant the expense of crushing and pulverizing slate and rock for this purpose? We would be glad to see this question thoroughly discussed by those who have had experience in the use of stone dust for this purpose.

Some Things Are Beyond Understanding

"Safety First" received a hard jolt recently when the miners employed at mines No. 19 and 20, of the J. R. Crowe Coal Co., near Pittsburgh, Kan., walked out and refused to work because R. A. Gray, general superintendent for the coal company, posted safety-first signs in and about the mines. They were placed on the tippie, in the engine and boiler rooms, at the pit-head, at the powder house and at different places in the mines, where there was the least bit of danger to be encountered. The pit cars were adorned with the signs, and the mottoes were conspicuous in the weighing office and on the screens—in fact, they were placed in every prominent position available in and about the mines.

Shortly after the signs had been posted, the mine committee for the United Mine Workers waited upon Superintendent Gray and asked that he remove the warnings. In his surprise, he refused their demand, and at once a strike was ordered and immediately put into effect at both mines. The men gave no reason why the objection was raised further than to say they are able to take care of themselves without having danger signs facing them at every turn. Over 400 miners are engaged in the strike and the grievance has been referred to the executive board to be settled.

If anything could be done to dampen the ardor and smother all enthusiasm on the part of a mining company for "safety" in their operations, surely the Kansas miners have selected that course. Let us all hope that the miners of the Crowe company are in a class by themselves. We also trust that justice and retribution be delayed in their case until they have been brought to see the great harm they are working against the cause of organized labor in the mines of America.

Operators Are Not a Unit

The differential for machines is less in Illinois and Indiana than in Ohio, and this fact has made a difference in interest between the operators in those states. The Ohio operators may be expected to resist the Green Anti-Screen Bill to the bitter end, but the result is hardly likely to be more successful than the attack in Illinois on the practice of solid shooting.

The greatest difficulty operators in Illinois have to contend with is the multiplicity of separate scales existing in that state. This condition makes the Illinois owners anything but a unit.

There has been some talk that the Illinoisans were going to draft an equal scale from end to end of the state. We know for a fact that such action will not be sanctioned by some of the large operators in Illinois.

Wanted--a Leader

Probably never before in the history of the bituminous-coal industry was there such urgent need of a generalissimo of the army of operators. Grown complacent under the soothing belief that the miners cannot precipitate an industrial strife, because of depressed business conditions, the lack of cohesion, and uniformity of action in a national wage agreement was never before so evident.

Independence of initiative is the salient feature in all sections, and the miners are showing themselves quick to accept the possibilities of this chaotic situation by completing the disruption of what meagre semblance of organization still prevails between the contiguous states. Acting upon their own motto, "United we stand, divided we fall," the miners will first effect a dissolution of the producers' organization into its constituent elements and then by concentrating all the powerful resources of the U. M. W. of A. upon each unit in turn, a victory will be ultimately assured.

The Pittsburgh district has its John H. Jones and W. K. Field, Ohio, its Woodford, its Maurer and others, while Illinois boasts its Peabody, Scholz, Taylor, Moderswell and Moorshead, but where is the man who can weld these units into a whole?

The Situation at the Labor Conferences

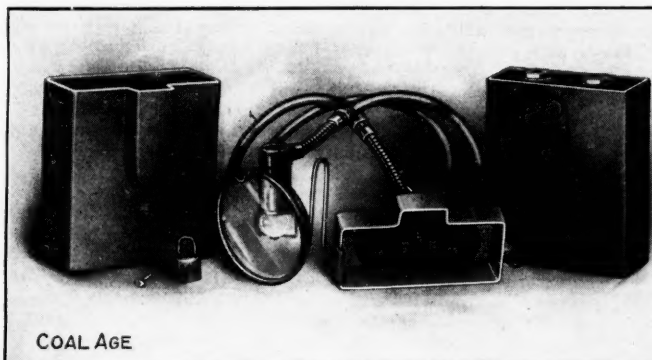
The overtures of the miners of the Pittsburgh district asking for a continuation of the previous scale were accepted at Pittsburgh, Mar. 30. Essentially this same plan was offered at the Chicago conference, but could not be accepted by any single state at that time. Immediately upon the adjournment of the Convention, the policy committee of the miners decided to offer it individually to the separate districts with the result that an agreement was effected on this basis in the Pittsburgh district.

Because of the complications arising as a result of the new mine-run law in Ohio, it will be impossible to arrange a new scale on the same basis as the one just expired. There are also serious difficulties in the way of an agreement being reached in Illinois, but indications point to an early settlement of the Indiana scale.

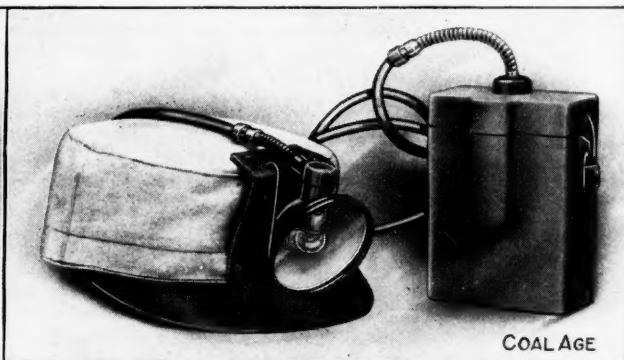
While no formal suspension of mining will take place in the Pittsburgh district, operations will necessarily be restricted, pending the liquidation of heavy stocks accumulated in anticipation of the more or less protracted suspension. The output of this district since the cessation of lake shipping last fall has averaged 70 per cent. of full rated capacity, whereas consumption during the past two or three months has probably not exceeded 50 per cent. normal. Thus in order to permit consumption to catch up with production, operations will probably be at about 50 per cent. until lake shipping opens up.

A Locked-Case Electric Safety Lamp for Use in Gaseous Mines

After securing the approval of the U. S. Bureau of Mines for the use of its lamps in gaseous mines, the Witherbee Igniter Co., manufacturer of the Wico lamp, proceeded at once on the attainment of its ultimate ambition, to produce an indestructible lamp.



COAL AGE



COAL AGE

SHOWING IMPROVED WICO ELECTRIC LAMP BEFORE AND AFTER ASSEMBLING

In the meantime, a demand had sprung up for a locked-case construction which would prevent the connections being tampered with from the time the equipment left the lamp house until its return. Hence the Wico locked-case electric safety lamp was made to combine this feature with the necessary protection for the battery. It may now be dropped from a height of 5 ft. on solid rock without danger of breaking the battery jar, and, in testing, the lamps have been dropped from a height of 20 ft. on frozen ground without injury.

It has been determined in practice that a charge of 5c. per day to the miners for the use of the lamp will not only keep the batteries charged, but purchase a new equipment at the end of the year. Most of the parts of the locked-case type will last many years.

The accompanying illustrations show how the hinge and hasp for the padlock are case-integral with the case and cover. The safety device which extinguishes the glowing filament in case of bulb breakage, makes the replacement of the standard Ediswan bulb easier than the bayonet-lock formerly used. Complete disassembling of the equipment can be accomplished in a few minutes. All parts are made interchangeable in accordance with the best American practice. The aluminum case is a remarkable example of metal casting. Battery efficiency has now been fully demonstrated in practice, both as to hours of service on a charge and retention of liquid electrolyte.

The locked-case Wico lamp may be seen in use at the government's experimental mine at Bruceton, Penn.

England Faces a Big Coal Strike

Supported by the Miners' Federation of Great Britain, 135,000 coal miners in the Yorkshire pits, in Yorkshire, have gone on strike, demanding the introduction of a minimum rate of wages; 150,000 more miners have declared their intention of striking this week if their demands are not granted immediately. The situation is serious and it is expected that there will be a long struggle before an adjustment is effected.

BY THE WAY

It is not easy to show the way to a blind man.

An ounce of patience is worth a pound of brains.

No wind can do him good who steers for no port.

The end of passion is the beginning of repentance.

A man must make his opportunity as oft as find it.

The man who obeys his superior instructs his inferior.

Possession is nine points of the law and they say there are ten.

One penny in the money-box makes more noise than when it is full.

Legal Department

Recent Judicial Decisions

By A. L. H. STREET*

North Dakota Coal Freight Rates—The North Dakota law of 1907, which prescribes maximum freight rates on interstate shipments of lignite coal, is found to be reasonable as to some of the railroads in the state and unreasonable as to others. (North Dakota Supreme Court, *State vs. Northern Pacific Railway Co.*, 145 Northwestern Reporter, 135.)

Assignment of Mining Leases—A clause in a coal mining lease prohibiting assignment of the lessee's interest without the lessor's consent is waived by his acceptance of rent from the assignee. The lessee, however, remains liable on his express agreement to pay rent for the full time the lease shall run, unless the lessor accepts the assignee as substitute lessee. (West Virginia Supreme Court of Appeals, *Kanawha-Gauley Coal & Coke Co. vs. Sharp*, 80 Southwestern Reporter 781.)

Effect of West Virginia Mine Law—The West Virginia Mine Foreman Law does not excuse a mine operator from liability for injury to an employee, resulting from failure to use due care to provide reasonably safe appliances and places of work, except insofar as the duty is devolved upon the foreman by such law. A mine owner is liable for death of an employee who came in contact with an uninsulated wire carrying a heavy electric voltage, if the employee did not know of the existence of the danger and was killed while engaged in the line of his work. (West Virginia Supreme Court of Appeals, *Humphreys vs. Raleigh Coal & Coke Co.*, 80 Southeastern Reporter 803.)

"Independent Contractor" and "Employee" Distinguished—A person who was engaged to move a water tank for a coal company at an agreed price was an independent contractor, and not an employee in the sense that the company would be liable to him for injury while doing the work. But, although the rule which requires an employer to furnish his workmen with reasonably safe places of work does not extend to contractors, there exists a duty even as to them to use a reasonable degree of care to protect them and their employees from injury on account of dangerous condition of the premises. (Kentucky Court of Appeals, *Wells vs. W. G. Duncan Coal Co.*, 162 Southwestern Reporter 821.)

Use of False Weights and Measures—An owner of a business in which weights and measures are used is presumed to know of any falsity in them. (Indiana Supreme Court, *State vs. McCaffrey*, 103 Northeastern Reporter 801.)

Operations Conducted by Contractors—In a suit against a coal mining company for death of a miner caused by explosion of dust which had been permitted to accumulate, it was no defense that the mining operations were being conducted by a contractor; the mining company being chargeable under the laws of the state with the duty of avoiding dangerous accumulations of dust. (Kansas City Court of Appeals, *Gray vs. Grand River Coal & Coke Co.*, 162 Southwestern Reporter 277.)

Where Equipment is Taxable—A coal company's barges used in carrying fuel are taxable only in the county in which the company has its principal place of business, and not in another county in which they may be found by the assessor while being loaded and unloaded. But, although such property is erroneously assessed in the latter county, the company's failure to apply to the board of review and correction for relief from the assessment, as required by law, waives the invalidity of the assessment, unless that course was prevented by fraud of the taxing officers. (West Virginia Supreme Court of Appeals, *Island Creek Fuel Company vs. Harshbarger*, 80 Southern Reporter 504.)

Who Are Mine "Employees?"—Operator's Responsibility for Defective Condition—A miner was killed in a cross-entry by the fall from the roof of a block of slate, called a "horse-back." At that time he was working at the request of his grandfather, who, under contract with defendant coal company, had undertaken to do the work involved in mining the coal, but defendant retained supervision over the work and paid the deceased miner's wages to him directly. At the time of the accident the cross-entry had been approved and in effect ac-

cepted, although not measured nor paid for. Held, that the deceased miner was an employee of the company, so as to render it liable for any failure to use reasonable care to maintain his working place in safe condition; that it was negligence to fail to support the roof after notice that it was in a dangerous condition; and that the company cannot rely upon any negligence of a co-employee of the decedent, since the fellow-servant doctrine does not apply to an injury resulting from an employer's breach of a nondelegable duty. The court said: "The work of driving the entry beyond the end of the track was continued. After removal of the coal for a short distance beyond, a blast was fired in the overhanging slate, which resulted in leaving the debris to be removed; and at the time of the accident deceased was engaged in carrying pieces of this slate to, and loading them upon the car. It is a mistake to suppose, as counsel do, that the work deceased was doing, within the space about the car where he was killed, was either opening that place for work or making it safe. It should constantly be remembered that the work of the deceased within that space was simply to use it as a passageway to carry material to the car; and the decisions upon which counsel rely are inapplicable for that reason." (United States Circuit Court of Appeals, Sixth Circuit; *Big Hill Coal Co. vs. Clutts*; 208 Federal Reporter 524.)

Substitution of Leases—Damages for Breach by Lessee—When a new coal-mining lease is substituted for a pre-existing one, all liabilities accruing up to the time of the making of the new lease still remain governed by the original contract, in the absence of agreement to the contrary embodied in the substituted lease. In suing to declare forfeiture of a lease on account of the lessee's failure to pay royalties and to prosecute work with reasonable diligence, the lessor is entitled to recover damages sustained by him on account of the breach. (Alabama Supreme Court, *Pollak vs. Stouts Mountain Coal & Coke Co.*, 62 Southern Reporter 531.)

Contributory Negligence of Injured Miner—A lignite coal miner, injured through fall of a mass of clay from the roof of the room where he was working, cannot recover against his employer where it appears that, although it was his duty to examine the roof and to remedy any discoverable defects, he failed to do so, and that his injury is directly attributable to such contributory negligence. (North Dakota Supreme Court, *Jackson vs. Chase*, 144 Northwestern Reporter 235.)

Proof of Agency—When one sued for the price of coal interposed a defense that plaintiff was estopped to recover because it had held the agent, from whom the purchase was made and against whom defendant had a personal counterclaim, out as owner of the coal, the burden was on defendant to establish that defense, and not on the plaintiff to show that defendant knew or ought to have known that the agent was acting as such. (Wisconsin Supreme Court, *Pennsylvania Coal & Supply Co. vs. Schmidt*, 144 Northwestern Reporter 283.)

Right to Recover Statutory Penalty Not Assignable—In recently deciding that, under the West Virginia statute, which prescribes a penalty of \$500 for mining coal within 5 ft. of line of adjacent land, a claim for such a penalty is not assignable, the Supreme Court of Appeals of that state said: "Obviously the penalty given by the statute here in question is not intended as compensation for coal taken or damage to property. It may be incurred without the taking of any coal from the land of the party entitled to sue. The taking of any coal at all within 5 ft. of the division line, and out of land belonging to the taker himself, inflicts the penalty. . . . The enactment of it seems to have been nothing more than an exercise of the police power of the state. . . . It does not stand in lieu of the right of action for injury to the land by the mining of coal therefrom, or a right of action for the value of coal taken. . . . An assignee of such person is clearly not the person injured. . . . It does not say the person injured, or his assignee, may sue. It is a highly penal statute, and falls under the rule of strict construction. Such statutes do not include anything beyond their letter, even though within their spirit. . . . Assignability of such claims encourages litigation and strife. . . . Public policy forbids the conversion of penalties into commodities or assets." (Wilson vs. Shrader, 79 Southeastern Reporter, 1082.)

*Attorney-at-Law, St. Paul, Minn.

Discussion By Readers

Widths of Opening and Pillar

I want to thank COAL AGE for the publication of my inquiry and the answer given in the issue, Feb. 28, p. 379. Following the suggestion made that some important data had been omitted in my last inquiry and for the information of readers who may further discuss this question, I desire to give the following items:

The coal of the upper seam is a hard bituminous variety and, like that in the lower seam, is unaffected by exposure to air. The seam is from 40 to 48 in. in thickness, and free from impurities; it is underlaid with a hard bottom of sandy shale and likewise overlaid with a hard sandy shale varying from 10 to 30 ft. in thickness. The entire cover overlying the upper seam ranges from 50 ft. at the outcrop workings to 1000 ft. in the mountain. This cover is composed mostly of shale, sandstone and thin seams of coal. Both coal seams pitch about 2 per cent. into the hill.

In the working of the lower seam, no mud partings or slips have occurred thus far, except in outcrop work and when passing under small streams under light cover.

All the coal in both seams is undercut with chain machines and blasted with Monobel powder. No gas has yet been found in the upper seam and only small quantities have appeared in the lower seam. The lower seam has made but little water and this follows up the working face at the dip. There is little or no water in the upper seam, which is practically dry. I shall be glad to see these conditions further discussed by readers who have had experience under similar conditions.

THOMAS C. MILLER, Engineer.

Benham, Ky.

Safety or Refuge Chambers in Mines

Letter No. 1—The article presented by Charlton Dixon, COAL AGE, Mar. 21, p. 498, drawing attention to the need of providing safety or refuge chambers in mines, should not be passed by lightly. I heartily indorse all that he has said in that article.

Going back and recalling past experience, we find that in the Cherry (Ill.) mine explosion, which occurred Nov. 13, 1909, twenty men saved themselves by withdrawing into an improvised refuge chamber from which they were rescued, a week later. This incident alone emphasizes the importance and practical use of providing such refuge holes, at convenient points in every mine.

If I am not mistaken, some of the mines, in European countries, have provided such safety chambers. The idea is not new, but Mr. Dixon deserves much credit for drawing attention to its importance and suggesting that the matter be taken up and thoroughly discussed. I earnestly hope that much good will come from such a discussion.

It is a matter of common observation that the large majority of the victims of mine explosions have not been

killed outright by the force of the explosion, but have been overcome, later, by the afterdamp. In many cases, there is evidence that these men have lived for hours or even days after the explosion took place. In such case, who would deny that a refuge chamber located in the live workings, would have been the means of keeping the men alive until help could reach them.

In the campaign for "Safety First," is it not true that we are overlooking some of the most important points to be considered. Mine explosions are of sufficient frequency to demand the most careful consideration, and every possible preparation should be made to overcome their dread effects. We may say that fully 90 per cent. of the explosions of gas and dust in mines occur at or near the working face, in what are called the "live workings." Large mines are, as a rule, divided into districts that are more or less separate. Each district should have a refuge chamber. As far as practicable, the districts should be separated from each other by a continuous pillar of coal, where the room-and-pillar system is in use. In my opinion, refuge chambers should be provided for in the original layout of the mine. No mine plan should be complete without this provision. They are of as much importance as any other features of the mine.

I would suggest that a refuge chamber should be driven about 18 or 20 ft. wide and, say 70 ft. long, so as to accommodate at least 100 men. The chamber or room should be driven in solid coal, without cut-throughs connecting it with other openings.

A refuge chamber can be fitted up and furnished, according to the judgment of the men in charge; but, in any case, each refuge chamber should be reached from the surface by boreholes, through which air, water and food could be supplied to the men entombed therein. There should be casks for holding water, a sanitary closet and disinfectants; and it might be expedient to have on hand a case of first-aid remedies, and, possibly, one or more sets of breathing apparatus. This last named equipment, together with oxygen tanks, etc., will not be considered by many as essential.

The main feature of the refuge chamber should be to provide a place where the men can be kept alive until rescued. It is most important that the chamber be provided with substantial doors that can be closed and sealed, to prevent the entrance of any poisonous gases into the inclosure.

PENNSYLVANIA ENGINEER.

Pittsburgh, Penn.

The Certificate Law

Letter No. 24—The recent discussion in reference to the possible interchange of certificates of competency for mine foremen and firebosses has interested me much. The matter is under consideration, at the present time, with the board of examiners in this (Alberta) province.

I hold a mine manager's certificate of competency, granted me in Edinburgh (Scotland), in 1909. The new

mining law, in this province, that came into effect in August, 1913, reads as follows:

The chief inspector of mines may sign and deliver a certificate, without examination, to any person holding a certificate from any other country, providing the board of examiners reports that the standard of training and examination required for the granting of such certificate is equivalent to that required for the granting of a corresponding certificate under this act.

I have made application to the examining board for a certificate of competency, to be granted under the law I have just cited and, at the present time, my application is under consideration by the board. It is my personal interest in this regard that has caused the discussion of this question to appeal to me very strongly.

ANDREW BARCLAY.

Bankhead, Alta., Canada.

✂

Letter No. 25—It is quite generally admitted by mine workers that only practical men should be allowed to qualify for a mine manager's certificate. As I have been working in mines, from 10 years of age till now, I would naturally be expected to favor this view, which I do to a certain extent.

We must not forget, however, that one of the greatest boons known to mining was the work of a man who knew nothing of practical mine work. I refer to Sir Humphrey Davy, the inventor of the Davy safety lamp. It was Davy's knowledge of physics and chemistry that led him to this discovery so important in coal mining. It is quite possible that if the history of the development of the different types of safety lamps and other important features of mine equipment were known, it would be found that many of these were the work of men who knew little or nothing of mining. We are indebted to Galileo for much of our present knowledge of atmospheric conditions; to Torricelli, for the barometer; to Isaac Newton, for the knowledge of the laws of gravitation, and to many others whose knowledge of science has affected the practical work of mining.

I believe that a man who has qualified and received a certificate of competency in one state, should be likewise qualified to hold a similar position in another state. His study of mining has acquainted him with most of the difficulties he is likely to meet anywhere. A man who understands the nature and danger of coal dust in the mines of Pennsylvania, will be capable of treating this matter in Colorado. In my opinion, it is a mistake to think that only local men understand the dangers and are capable of working the coal successfully in their several districts. It is probable there are many men in other districts who would be able to mine the coal more successfully than many of the men already acquainted with the local conditions in a certain mine or district.

I would state, as an example, in support of this opinion, according to Robert Peel, only one-third of the coal is being taken from a 30-ft. seam in South Staffordshire, and this seam is one of the best coals in England. Local talent does not show to advantage in this case. If the report be true, competent mining men from other localities have expressed the opinion that, by the adoption of a suitable method of longwall working, practically 100 per cent. of the coal could be taken from this seam. In support of their view, they refer to other thick seams worked by the longwall system, on the Continent, where most all of the coal is recovered. It is only fair to allow, how-

ever, that the failure to extract a larger percentage of coal is quite often due to the desire to obtain quick returns on the investment.

I cannot agree with the writer of Letter No. 23 that the mining law of Illinois, requiring that all candidates in examination must be residents of the state, "is right because it protects its own citizens." In New Zealand, a coal digger from Scotland or England is not allowed to dig coal till he has been two years in the mines of that country. It is not, there, a question of ability, as the men debarred are men who have dug coal all their lives. In parts of Germany, a boy going into the mine must push cars and do other work before he is allowed to learn how to dig coal. In India, a boy must follow the same occupation as his father.

Such restraining laws are common in foreign countries; they do not protect; but, by diminishing the opportunities, work hardships and destroy the ambition of competent men. The stagnation produced in the industries, by such laws, is plainly evident. As an excuse for looking to this country for a manager, Lord Hamilton is reported to have said, "There is something paltry about the British system, which tends to interfere with the mental activity of employees and reduces them to mere automata, sacrificing merit to seniority."

I would favor the issuing of certificates of competency by the Federal government, as I believe this would lead to the adoption of a more uniform system of examination in the several states. The examination could be made to cover every phase in coal mining, and I believe would eliminate, to some extent, at least, favoritism in the granting of certificates.

I do not think that certificates should be granted to men who have no knowledge of mine gases, permitting them to take charge of nongaseous mines. Suppose, for example, marsh gas (CH_4) has never been found in the mines in a certain district, and a mine foreman employed in one of those mines knows nothing of mine gases. How would such a man be able to deal safely with a mine fire, when he is liable, then, to meet with two dangerous gases, carbon dioxide (CO_2) and carbon monoxide (CO). The latter may even prove explosive, making the conditions even more dangerous. Under such conditions, the mine foreman must be able to act at once and intelligently. He cannot wait for the inspector to arrive.

Referring to uniform state examinations, there could be no objection to giving questions that have a special bearing on local conditions in any state, provided this did not exclude other important questions. It is not long ago that mine foremen had little idea of the size of pump necessary to deal with a given quantity of water, in a given time. This and other like instances show the necessity of the examination dealing with all classes of mine work.

Speaking of the Federal government issuing the certificates of competency, it would not be necessary for them to hold the examination, which could be held, as now, by the state examining board, in conformity with the general rules and regulations laid down by the Federal government. But the certificates issued by the Federal government, on the recommendation of the local examining board, would make the holder of such certificate eligible for the position in any state.

ROBERT McCUNE.

Dawson, N. M.

Fan Ventilation

Being much interested in the question of the ventilation of mines, the inquiry of D. J. Hopkins, Jan. 24, p. 180, in reference to the installation of a second fan to increase the circulation of air in the mine, attracted my attention. I believe the plan suggested by Mr. Hopkins to be entirely practicable, providing the air shaft is large enough to carry the amount of air required.

Before we can fully decide on the feasibility of the proposed plan, it is important to know the size of the upcast and downcast shafts as well as the size of the main intake and return airways, in any proposition of this kind. I would suggest that if the sectional area of the airshaft is sufficiently great both of these fans could be installed at the top of the shaft so as to work in parallel. This plan, however, would require the splitting of the air current at the foot of the shaft, in order to provide a separate current for each side of the shaft. In preference to this, I would, if possible, place each fan over its own air shaft.

In my opinion, a second fan, operating in parallel with the first, is of great value for the purpose of increasing the circulation in a mine; but, in no case, would I install the second fan as a "booster." In the installation of mine fans, it is important never to fig-

ure the capacity of a fan too closely, as it may and frequently does, happen that gas feeders are met heavier than what are expected and a greater air volume is required to properly ventilate the mine.

In all mine ventilation, I favor the splitting of the air current wherever this can be done to advantage. The method provides purer air at the face of each district, or section of the mine, and the gases generated in the several districts are carried at once into the return airway, without passing through other sections of the mine. Also, the velocity of the air sweeping the working face is much lessened, thereby reducing the friction of the air current and exposing the workmen to less discomfort owing to the strong draft. There is, also, less danger of the flame of the lamp being blown through the gauze where safety lamps are used. As stated in COAL AGE, Vol. 2, p. 335, the mine resistance is always decreased by splitting, provided the total sectional area of all the splits is greater than the sectional area of the air shaft or main airway; otherwise, the splitting of the air current will increase the mine resistance. My experience leads me to recommend that the plan suggested by Mr. Hopkins should be adopted.

JOHN SUTTON,

Fireboss, Clinton Coal Co.

West Terre Haute, Ind.

Study Course in Coal Mining

By J. T. BEARD

The Coal Age Pocket Book

ADDITION OF DECIMALS

The addition of decimals differs in no respect from the process of addition previously explained. As before, figures of the same unit value must be written in the same column.

Rule—Write the decimal numbers to be added so that the decimal points of all the numbers will be in the same vertical line, and likewise the tenths, hundredths, thousandths, etc., in their respective columns. Then, beginning on the extreme right, add together the numbers standing in each consecutive column, proceeding as in the addition of whole numbers, writing the units figure of each sum in its respective column and carrying the tens figure, if any, to the next column on the left. When all the columns have been added, place a decimal point in the result under the decimal points of the numbers added.

The following examples will make the process clear:

0.314	0.468
0.40561	34.1095
0.3502	6.034
0.69	19.9823
0.0045	0.32
1.76431	60.9138

The right-hand columns will frequently contain only a few figures. As above, the addition of decimals will often produce a whole number and a decimal. The addition is always carried past the decimal point as though the latter did not exist, pointing off the figures in the sum, however, to correspond to the columns added.

SUBTRACTION OF DECIMALS

The process of subtracting one decimal number from another is the same as in the subtraction of one whole number from another.

Rule—As in whole numbers, write the lesser number under the greater, placing tenths under tenths, hundredths under hundredths, etc., annexing ciphers, if necessary, to make the decimal places equal in each number. Beginning on the right proceed as in the subtraction of whole numbers, and point off the result to correspond to the numbers subtracted.

Example—Subtract (a) 0.10475 from 0.29300; and (b) 0.9706 from 1.04635.

Solution—	(a) 0.29300	(b) 1.04635
	0.10475	0.97060
	0.18825	0.07575

MULTIPLICATION OF DECIMALS

The process is identical with the multiplication of whole numbers, except for the matter of pointing off the product.

Rule—Ignoring, for the time, the decimal points, proceed as in the multiplication of whole numbers, disregarding any ciphers standing on the left. Finally, point off from the right of the product, as many decimal places as there are in both numbers, prefixing ciphers if required to complete the number.

The Coal Age Pocket Book

The following examples will illustrate the rule:

20.7654	.001764
3.42	.0256
415308	10584
830616	8820
622962	3528
71.017668	.0000451584

In the first of the above examples, there were four decimal places in the multiplicand and two in the multiplier, making it necessary to point off six places in the product. In the second example, there were ten places to be pointed off in the product, which contained but six figures, and it was therefore necessary to prefix four ciphers before placing the decimal point.

Multiplying by 10, 100, 1000, etc.—To multiply a whole number by 10, 100, 1000, etc., it is only necessary to annex as many ciphers to the number as there are ciphers in the multiplier. Thus,

$$1728 \times 100 = 172,800$$

To multiply a decimal number by 10, 100, 1000, etc., it is only necessary to move the decimal point as many places to the right as there are ciphers in the multiplier, annexing ciphers if necessary to complete the number. Thus,

$$\begin{aligned} 0.4381 \times 1,000 &= 438.1 \\ 0.004 \times 10,000 &= 40 \\ 1.45 \times 100,000 &= 145,000 \end{aligned}$$

DIVISION OF DECIMALS

The operation of division is the reverse of that of multiplication. The process is identical with the division of whole numbers, except for the pointing off of the quotient.

Rule—Ignoring, for the time, the decimal points, proceed as in the division of whole numbers, disregarding, as before, any ciphers standing on the left. Finally point off from the right of the quotient as many decimal places as those in the dividend exceed those in the divisor.

Example—Divide (a) 11.284 by 2.6; and (b) 35.1 by 0.156.

Solution—	(a) 2.6)11.284(4.34	.156)35.100(225
	104	312
	88	390
	78	312
	104	780
	104	780

When the divisor, as frequently occurs, contains more decimal places than the dividend it is necessary to annex ciphers to the dividend until it contains an equal number of decimal places and the quotient, to that point, will be a whole number, as shown on the right, above.

Examination Questions

Miscellaneous Questions

(Answered by Request)

Ques.—What thickness of barrier pillar does the law of Pennsylvania require along a boundary line?

Ans.—The Pennsylvania anthracite-mine law compels the owners of adjoining coal properties to leave or cause to be left a pillar of coal, in each seam that is worked by them, along the line of an adjoining property. The pillar of coal so left shall be of such width that, taken in connection with the pillar to be left by the adjoining property, it will be a sufficient barrier for the safety of the men working in either mine, in case the other mine should be abandoned and allowed to fill with water. The law states that such width of pillar is to be determined by the engineers of the adjoining property owners, together with the inspector of the district.

Although the law does not specify the actual thickness or width of barrier pillar, the rule in common use in the anthracite region has been to add 5 ft. to 1 per cent. of the depth of the pillar below the natural drainage level, and multiply this sum by the thickness of the seam, in feet; the product is the required width of barrier pillar, in feet.

The bituminous-mine law of Pennsylvania (Art. 2, Sec. 2) requires that when the workings of a mine approach within 300 ft. of the boundary line between that and an adjoining mine, the operator or superintendent of the mine first mentioned shall make application to the inspector of the district for information as to the proximity of the workings of such adjoining mine or mines.

If said adjoining workings are within 300 ft. of the boundary line at their nearest approach thereto, the inspector must notify said operator or superintendent, whose duty and right it is to enter and survey the said adjoining workings, on the written authority of the inspector. Such survey must be placed on the mine map kept at the office for the use of the mine officials and the inspector, and for the inspection of any person working in said mine, as desired, but in the presence of the superintendent or mine foreman.

Ques.—How many cubic feet are there in a piece of coal $23 \times 19 \times 8$ ft.; and what is the weight of the coal if its specific gravity is 1.6?

Ans.—The cubical contents of this block of coal is $23 \times 19 \times 8 = 3496$ cu.ft. To find the weight of the coal, multiply the cubic contents by the weight of 1 cu.ft. of water (62.5 lb.) and that product by the specific gravity of the coal; thus $(3496 \times 62.5 \times 1.6) \div 2000 = 174.8$ tons.

Ques.—(a) Find the pressure per square inch on the tamping of a 3-in. drill hole tamped with 3 ft. of clay, when 6 lb. of gunpowder have been ignited in the hole. (b) Give the velocity of a wind from such a pressure when the energy of the charge has all been spent on the atmosphere, in a 6 by 8-ft. entry, neglecting resistance, the atmospheric pressure being 14.7 lb. per sq.in.

Ans.—We assume that the question refers to common black blasting powder instead of "gunpowder." The volume of the gaseous products of the explosion of black blasting powder, measured at a temperature of 32 deg. F. and a pressure of one atmosphere, equals 360 times the original volume of the powder. Since the solid products of the explosion form one-third of the original volume of the powder, the 360 volumes of gaseous products are confined, at the moment of explosion, in two-thirds of the space occupied by the original powder. But since the pressure of gases varies inversely as their volume, for a constant temperature, the pressure at the moment of explosion, due to the compression of the gases produced, is $360 \times \frac{3}{2} \times 14.7 = 7938$ lb. per sq.in., measured at a temperature of 32 deg. F.

The pressure at the moment of explosion, however, is still further increased by the rise of temperature from 32 deg. F. to that caused by the combustion of the powder in the drill hole. If this combustion were instantaneous, the temperature produced would be somewhat above 6000 deg. F. The explosion of black powder, however, is never instantaneous; and, in the case of blasting powder, the grains of powder burn slowly, the ignition spreading from one grain to another and the heat being developed gradually. This action produces a gradually increasing temperature and pressure in the drill hole, until rupture takes place in the coal and the gases are permitted to escape into the atmosphere. Owing to these conditions, the temperature of the explosion of black blasting powder in a drill hole, rarely exceeds 2000 deg. Fahrenheit.

The pressure due to this temperature would then be per sq.in.

$$7938 \times \frac{460 + 2000}{460 + 32} = \frac{7938 \times 2460}{492} = \text{say } 40,000 \text{ lb.}$$

(b) It is absurd to ask for the velocity of wind produced in a 6 by 8-ft. entry by the explosion of a given weight of blasting powder in a drill hole, as there is no method by which this can be calculated; and, indeed, the results would vary greatly in fact and give no practical information.

It is possible, however, to estimate the theoretical velocity of the gases projected from a drill hole, under the pressure created by the explosion of the powder, the degree of accuracy depending on the correctness of the calculation of the pressure produced, which is then only approximately true at the initial point and moment of explosion.

A calculation based on the average composition of blasting powder, and the relative volumes of gases produced, shows that these gases may have a density 18 times that of hydrogen gas, at normal temperature and pressure. The theoretical velocity, due to a pressure of 40,000 lb. per sq.in., for this density of the gases, as calculated from the formula $v = \sqrt{2gh}$, is practically 60,000 ft. per sec., an almost inconceivable velocity.

Inquiries of General Interest

Path of Crankpin of an Engine Driver

I am sending a question to COAL AGE, in hopes that a correct answer can be given. There has been a considerable difference of opinion expressed, here, in reference to the answers obtained to this question. The person giving the problem states that the correct answer is 16.781+ ft. Although this question is not strictly in the line of other questions answered in COAL AGE, we would like to have the correct solution published, and believe this would be of interest to all, at least as a mental exercise. The question is as follows:

What distance does the crankpin on a locomotive wheel travel while the wheel makes one revolution running on the rail; assuming the wheel to be 5 ft. in diameter and the crankpin to be midway between the center and the tread of the wheel?

Johnstown, Penn.

We are glad to give the solution to this question or any other that does not involve the use of higher mathematics. We believe every student of mining is benefited by the study of simple mathematics.

The path described by the crankpin of an engine driver is a curve known as a "prolate cycloid." It is the path described by any point within a circle when the circle rolls upon its circumference, on a plane surface, the plane of the circle or plane of revolution being at right angles to the surface on which it rolls.

Any point in the circumference of the circle will describe a path known as a "cycloid." The length of this path or the length of the cycloid, for a single revolution, is always four times the diameter of the circle. But, it is clear that when the circle makes one revolution, the center of the circle moves a distance equal to its circumference. The path described by the center of the circle is, therefore, a straight line parallel to the plane on which the circle rolls, and its length (πD) is equal to the circumference of the circle.

It is equally clear that the path described by any point lying between the circumference and the center of the circle must have a length less than $4D$ and greater than πD , or $3.1416D$. To determine the length of this path, or the length of a "prolate cycloid," by exact mathematical calculation, is a complicated process. It is, however, expressed very approximately by the following formula:

$$L = \pi D + 0.86 \left(\frac{d}{D} \right)^2 D$$

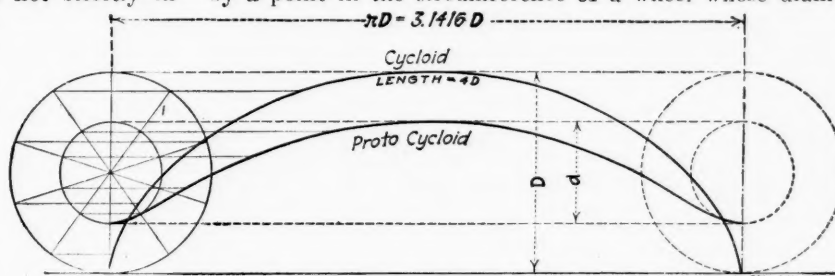
in which L equals the length of the path; D , the diameter of the circle; d , the diameter of the crank circle, all in feet or all in inches. In the present case, $D = 5$ ft.;

$d = 2.5$ ft.; and the length of the prolate cycloid described by the crank pin, in one revolution of this wheel, is approximately

$$L = 3.1416 \times 5 + 0.86 \left(\frac{2.5}{5} \right)^2 5$$

$$= 5 (3.1416 + 0.86 \times \frac{1}{4}) = 16.783 \text{ ft.}$$

The accompanying figure shows the cycloid described by a point in the circumference of a wheel whose diam-



ILLUSTRATING THE CYCLOID AND PROLATE CYCLOID CURVES

eter is D , and the prolate cycloid described by the crankpin, the diameter of the crankpin circle being d , which in the present case is one-half of the diameter of the wheel. The dotted circle shows the position of the wheel after making one complete revolution.

✂

Longwall, Packwall System

I beg to ask the readers and correspondents who have already given some valuable information concerning longwall-retreating methods, the following question:

Can the common packwall system of longwall mining with two or three sets of posts at the face, be made to successfully replace the room-and-pillar system, in a mine that has advanced about two miles. The coal is semi-bituminous and lies in a basin or syncline that is about 7 miles wide from north to south. The seam varies from 4 ft. to 4 ft. 6 in. in thickness, and the depth of cover from 300 ft. to 700 ft. at the middle of the basin. Above the coal is a blue rock from 4 ft. to 8 ft. thick, overlaid with a fine-grained sandrock and sandy shale that do not break over a long distance. The immediate bottom of the seam is a soft slate 9 in. thick, beneath which is a thin stratum of coal of the same thickness. Underneath that is a soft fireclay, which has a tendency to heave.

CONSTANT READER.

Windber, Penn.

[We shall be glad to have those interested and experienced in longwall work discuss this question of how a longwall face can be successfully started at the face of room-and-pillar workings that are fully developed. State the chief points to be considered before any attempt should be made to change the plan of working from the room-and-pillar system already developed, to the longwall method of the packwall system of mining. State what advantages may be expected to be gained by making this change.—Ed.]

Coal and Coke News

Washington, D. C.

The Interstate Commerce Commission has handed down a decision in the case of Campbell's Creek Coal Co. vs. the Ann Arbor R.R. Co. in which it further defines the portion of the Interstate Commerce act relating to the furnishing of cars and switching connections, and holds that the portions of the act relating to these two topics must be considered together. It also contends that the application of main line rates to points on the Kanawha & West Virginia and the coal and coke railroads, while they were denied to the complainant company, was undue and unreasonable prejudice which should be corrected either by canceling the main line rates to points on the lines mentioned or by establishing the main line rates as jointly with the Campbell's Creek region.

The substance of the complaint which gave rise to this case is found in the fact that the Campbell's Creek R.R. is a common carrier engaged in interstate commerce. The railroad is entirely separate from the Campbell's Creek Coal Co. Neither company owns the stocks or bonds of the other, and they are managed and operated separately. The road is distinct from the plant facilities, namely, the mine cars and locomotives and the tracks ramifying through the mines and leading to the tipples of the coal company, all of which are owned by the Campbell's Creek Coal Co. Complainants have sought in vain from defendants, the Kanawha & Michigan and its connections, the establishment of through routes and joint rates for shipments of bituminous coal from points on the line of the Campbell's Creek R.R. to the various destinations mentioned in Kanawha & Michigan tariff I. C. C. 31 and supplement 15 thereto. The joint rates sought are those applying from points on the main line and branches of the Kanawha & Michigan Ry. and points on the line of the Kanawha & West Virginia R.R. Because of the refusal of these rates shippers on the Campbell's Creek R.R. are compelled to pay in addition to the main-line or Kanawha district rates, which apply from Dana, the local rate of the Campbells' Creek R.R. to Dana, which is 15 cents per ton.

A decision has also been handed down in the case of the Hughes Creek Coal Co. vs. the Kanawha & Michigan Ry. Co., and in the Kelly's Creek Colliery Co. vs. the same. In this decision it is held that the complainant's request for through routes and joint rates between stations on the Kanawha & Michigan Ry. and its branches and the points specified in the complaint in eastern and southeastern territory on the lines of the Chesapeake & Ohio and its connection should be granted, the rates charged to be not in excess of those now applying to these destinations for shipments from the mines on the Chesapeake & Ohio. The charge that since the Chesapeake & Ohio and the Kanawha & Michigan are practically one road it is unjustly discriminatory for them to deny the Kanawha & Michigan lines access to markets which have been made available for Chesapeake & Ohio mines is held not to have been established as the identity between the two roads is not regarded as having been proven. At present the coal from the mines on the Kanawha & Michigan has competitive rates—that is, rates which permit it to meet the competition from other fields—only to certain territory in the northwest where the competition is very strong. In Cincinnati it has a competitive rate only by one connection of the Kanawha & Michigan, the Baltimore & Ohio Southwestern, with a resulting limited number of deliveries. The coal from the Chesapeake & Ohio mines on the other hand has not only an extensive market in the northwest, including all deliveries in Cincinnati, but also competitive rates to the Atlantic Coast and to markets in the East and Southeast. When rates from the mines are spoken of what is meant is rates from the stations on the main line or branches of the defendant railroads from which the mines ship their coal.

The Committee on Lands of the Senate has reported the administration bill for the leasing of coal mines in Alaska in a different form from that in which it was referred to the Committee on Mines before that committee was discharged from consideration. In the new form the bill provides for the designation of certain reserve areas in Alaska which are to be mined under the direction of the President whenever necessary while in all other areas it is provided that the lands

"shall be divided by the Secretary of the Interior into leasing blocks or tracts of forty acres each, or multiples thereof, and in such form as in the opinion of the Secretary will permit the most economical mining of the coal in such blocks, but in no case exceeding two thousand five hundred and sixty acres in any one leasing block or tract; and thereafter, subject to any prior valid existing rights, which said rights may be perfected under the laws in force at the time the same were initiated, the Secretary shall offer such blocks or tracts and the coal, lignite, and associated minerals therein for leasing, and shall award leases thereof through advertisement, competitive bidding, or such other methods as he may by general regulations adopt, to any person above the age of twenty-one years who is a citizen of the United States, or to any association of such persons, or to any corporation organized under the laws of the United States or of any State or Territory thereof."

HARRISBURG, PENN.

"The legislature might just as well place a state tax on hard-shell crabs and exempt soft-shell crabs as to tax anthracite coal and not bituminous," said Major Everett Warren, of Scranton, in the Dauphin County court, sitting in this city on Mar. 25, in the suit to test the constitutionality of the anthracite coal tax. "The taxes in this state must be uniform, and the legislature did not keep to the classification which it should have followed. By the same simile it might as well have taxed red-headed men only because it can tax men."

Attorneys for the state and for several cities and boroughs declared that the People's Coal Co., of Scranton has shown no grounds for relief in equity in bringing the suit to test the constitutionality of the tax. The Scranton company is understood to represent a number of other anthracite producers and the suit, which was filed in January, will probably go clear up to the highest court of the state, and, possibly, to the U. S. Supreme Court, for adjudication.

President Judge Kunkel, who has sat in a number of famous suits to test constitutionality, was on the bench and the People's Coal Co., was represented by Major Everett Warren, of Scranton, Ex-Judge F. W. Wheaton, of Wilkes-Barre, and Ralph Reimer, general counsel of the People's Coal Co. Deputy Attorney General Hargest took charge of the case for the state. Seated at the state's table were a number of attorneys, representing various cities and boroughs.

The plaintiffs offered an amendment to the bill in equity at the opening of the court, charging that in addition to the reasons advanced some time ago for declaring the law unconstitutional the law was local legislation and that, being such, it was illegal because it had not been advertised.

Speaking for the state, General Hargest declared that the company had failed to show in its bill any grounds for relief in equity. The law provides a way for a test without invoking the extraordinary powers of a court of equity, because there are laws which allow appeals from tax settlements by the state which are used every day and which have been employed to secure adjustment of cases involving millions of dollars. General Hargest attacked the averments that the law offended against the constitution of the United States and of the state because of loss as being not well taken. Taking up the contention that the law was a "makeshift" and that a portion of the income might be used for payment for surface damages, he said that such a statement was "scandalous" and that the plaintiff had no right to attack the state on such an assumption. As to the great and irreparable injury which it was averred the company would suffer if compelled to file reports and comply with the law by Feb. 1, he said, that the statement was absurd because the companies had complied with the law and had filed reports. He remarked that the plaintiff does not come into court with such clean hands as it should have in equity.

The deputy attorney general went through the bill and attacked each averment. On the amendments he said that if the tonnage tax was local legislation, then all anthracite laws were also local.

In answering the demurrer of the state to the suit Major Warren made the remark about the hard- and soft-shell crabs

to support his contention that the classification clause had been ignored. He argued that the Dauphin County Court can take jurisdiction in the case and asked what earthly difference it made whether the case was settled on the legal or equity side of the court. Equity, he asserted is the place to settle the integrity of the law and cited proceedings in valuation of coal lands in Lackawanna and Luzerne counties in support of his contention.

Taking up the answer of the state that there was impertinent matter in the bill, he denied it and said that if the Supreme Court could go into the history of the school code the bill could go into the history of the act, and if the state's highest court called the code "a subterfuge" in a dissenting opinion the present act might be styled a "makeshift" in a bill. Indications were given that the case may go to the United States courts by reference made by the counsel for the coal company that all but 8 per cent. of the anthracite is sold outside of the state.

The law, he said, added a tax to coal and did not relieve the land from local taxation; it has a defective title, and the penalty for failing to make a report he styled "a club." Throughout the argument the Major resented the attitude of the state and once said that the state was to blame for the delay in getting a hearing because of length of time taken to file its demurrer.

The main argument against the constitutionality of the act was that it violated the classification clause, the Major contending that it draws a hard and fast line between anthracite and bituminous. Taxation, he said, must be uniform and the coal produced in eight counties is to be taxed and that produced in twenty-eight others is exempted.

No decision is expected for a few days, probably weeks.

PENNSYLVANIA

Anthracite

Pottsville—The famous "barrier pillar case" one of the most important law suits ever appealed from the Schuylkill County court, was, on Mar. 23, decided in favor of Mine Inspector John Curran of the 18th district, who brought the suit to maintain the barrier pillar between the collieries of the Mill Creek Coal Co. and the Dodson Coal Co., at Morea. Inspector Curran feared that if the barrier was tampered with, subterranean bodies of water might break through it and drown hundreds of miners. He therefore got an injunction against the Mill Creek Coal Co. to prevent interference with the pillar. As this would prevent the mining of vast bodies of coal, the company appealed. The size of the barrier was finally fixed at 300 ft., the higher court sustaining this decision.

Wilkes-Barre—Charging that the Wilkes-Barre Anthracite Coal Co. is unlawfully removing coal from beneath private property on North Franklin and Union Sts., property owners in the Fourth Ward have filed eight separate suits against the company to restrain further mining under the tracts, and compensate the owners for the coal removed. Judge O'Boyle granted preliminary injunctions in all the cases.

Avoca—Two hundred men and boys, employed in the D. & H. Co.'s Langeliffs colliery refused to go to work on Mar. 26 on account of not having received their proper pay, so they claim. Superintendent Lovering had a conference with the employees and made an effort to amicably adjust the matter, but without success. The men are still out, but hope for a settlement in a day or two.

Mt. Carmel—More than 1500 miners formed in line on the night of Mar. 28, and marched from the Methodist Episcopal Church to the tabernacle where Dr. H. W. Stough, the evangelist, is conducting services. Headed by State Mine Inspector Ben. I. Evans, the miners paraded over the streets carrying banners and American flags. It was "Miners Night" at the tabernacle. Evangelist Stough spoke at length upon the great dangers encountered by those who work underground for a living. Nearly 100 miners "hit the trail."

Mahanoy City—Twenty feet of a Maysville schoolyard were swallowed in a mine breach on Mar. 23. The depth of the hole is not known. The five schools in the building did not hold sessions the next day. Old workings of the Gilberton Colliery honey comb the section. If the surface shows further evidence of settling the building will be abandoned.

Kingston—John W. Wier, a brakeman employed by the Kingston Coal Co. who was in the cab of a small locomotive, that was completely engulfed in a mine cave on Mar. 23, escaped by jumping. The cab was demolished and the engine toppled over on one side. The locomotive was righted on a temporary track and it required the combined power of four other small engines to haul out of the cave.

Shenandoah—The body of George Isgate, 55 years old, who was buried alive in the caving in of old workings of the Thomas Colliery on Mar. 20, was recovered on Mar. 25, wedged

in between coal, timber and slush 500 ft. below the surface. The second victim, John Decrish, an 18-year old youth, was found only five ft. away. Both bodies were badly mangled. The wife of Isgate, the mother of seven children, is in a critical condition and may die.

Treverton—The Pennsylvania Colliery, operated by the Susquehanna Coal Co., on Mar. 24, was the scene of a thrilling accident, when three miners were probably fatally injured, all having their skulls crushed by runaway cars. The loaded cars had been sent up a slope. The three men were awaiting the arrival of the empty cars at the bottom of the slope. As the cars reached the top, the side hooks, to which the rope and chain were attached pulled out, and both cars ran down the 900-ft. slope at terrific speed. They remained on the tracks to the bottom, where they were demolished. The men were caught in the débris.

Bituminous

Monongahela—The Black Diamond mine of the Pittsburgh Coal Co., which was closed on Mar. 6, due to the burning of the river and railroad tipples, resumed operation last week. The tippie in use is a temporary structure; the work on the permanent river and railroad tipples will be started at once, and pushed to completion.

Connellsville—Coke traffic was seriously interrupted during the past week by a strike of 6000 yard employees of the Monongahela division of the Pennsylvania R.R., who walked out early on the morning of Mar. 21, because the company had announced its intention of dropping one man from each of the yard crews. For several days it was impossible to move freight, but the company expects to have conditions at normal within a short time. The railroad brotherhoods have repudiated the action of the men in quitting work, and so far the strikers have been unable to enlist the support of the employees of other divisions. Brotherhood officials have sent word to men on other divisions who have been furloughed because of slack business to apply for the strikers' places.

Scottdale—The Valley works of the H. C. Frick Coke Co. was abandoned recently and wiped off the list as an operation. The coal has been exhausted and there is little possibility of the coking situation causing a condition that will entail firing the ovens at some future time to burn coal shipped from elsewhere. All the horses and mules have been shipped to other mines in the region. Many of them had never worked in any other mines. Mine Foreman Edward Quinn goes to Broad Ford it is said.

NEW YORK

Buffalo—The annual meeting of the Allegheny Operators' Association was held here on Mar. 26, at which President C. P. McCafferty and Secretary-Treasurer George E. Henry, of East Brady, were reelected. A committee, consisting of E. C. Roberts, W. D. Ward and J. R. Brady, of Buffalo, and A. J. Watson and L. B. Lewis, of Pennsylvania, was appointed to meet the miners at East Brady after the close of the Central Pennsylvania meeting. The meeting was first set down for the 31st, but it was afterward learned that the other meeting would not adjourn in time.

KENTUCKY

Lexington—It has been announced that the annual meeting of the Kentucky Mining Institute and the state first-aid contest, which has become a regular feature of that meeting, will be held here May 8 and 9. The committee in charge of the first-aid work hopes to secure from the Bureau of Mines one of their explosive galleries for the purpose of demonstrating explosions of various sorts, both of coal dust and of blasting powders. An interesting program is being arranged, which will be made public in a few weeks.

Jenkins—General Manager Everett Drennen, of the Consolidated Coal Co., returned this week from Washington, where he was successful in obtaining the introduction by Representative Langley, of Kentucky, of a bill appropriating \$50,000 for a Federal mine rescue station at Jenkins. Dr. Joseph A. Holmes, director of the Bureau of Mines, will give his support to the measure, the volume of the coal operations around Jenkins making the propriety of establishing such a station obvious.

OHIO

Gallapolis—Seven loaded coal barges of the Pittsburgh Coal Co., consigned for Louisville, were sunk near Gallapolis, Ohio, last week, causing a total loss, as no insurance was carried.

Columbus—J. M. Roan, Ohio safety superintendent, has given out a statement showing the benefits of his safety campaign during the past three months. For the first quarter of 1914 there were 25 fatal accidents in Ohio, as

compared with 32 for the corresponding quarter in 1913. The number of other accidents also showed a marked decrease. Many of the fatal accidents were due to the dangerous "draw slate" found in the eastern Ohio district. There was but one fatal accident in the Hocking Valley proper, one in Jackson district, one in Massillon district and one in Pomeroy Bend.

The wage situation in Ohio is in the most muddled condition in years. Neither the operators nor the miners are sure of their positions, and almost everyone anticipated the suspension of operations on Apr. 1. In fact, most of the operators had made active preparations for closing down for from 30 to 90 days time. Coal for fuel purposes had been stored and the mines generally cleaned up.

The mine-run law will not become effective until May 15 or 20, when the time limit for filing a referendum petition is over. Thus there is 45 days yet to consider the matter and to take any action desired to test the constitutionality of the new law.

Summing up the situation, Ohio operators to a man stand for a wage agreement which will not increase the cost of mining coal. They do not believe that the announced rate of 71¢/100c. per ton on the mine-run basis will be equitable as this is expected to increase the cost of mining from 3½ to 5c. a ton in Ohio fields.

Everyone is "up in the air" so to speak and there is much confusion over the issues at stake.

INDIANA

Petersburg—E. E. Kelsey has been appointed receiver for the J. M. C. Coal Co., which operates the mines at Massey, seven miles south of this city.

Jeffersonville—The larger towboats on the Ohio River have left their tows of empty barges, which they were bringing from New Orleans, and are being rushed to this point where 150 barges loaded with coal are waiting to be taken south, having been brought here by the smaller boats of the upper Ohio. On the recent rise of water 200,000 tons have been brought from Pittsburgh where the river has now fallen too low for further shipment.

Terre Haute—The United Mine Workers of District 11, which includes all the Indiana fields, except the Block mines, met here Thursday, Apr. 2, to consider the wage scale to be submitted later to the Operators' State Association in a joint conference. The Indiana miners will continue work for the present.

ILLINOIS

Springfield—Employers of labor and mine owners have had all doubts removed as to the validity of the Illinois compensation act by a recent decision of the Supreme Court, which sustains the act, both as passed in 1911 and 1912. Up to this time many operators refused to enter their acceptance of the act, doubting its validity.

Springfield—The operators in the 3rd District have elected an executive committee and have appointed Daniel Clark Commissioner for their own organization, which in the past has been a part of the Illinois Coal Operators' Association. It is understood that they have passed a vote, expressing a desire to join the 5th and 9th District Operators' Association, and will have a full representation at the joint scale meeting between the operators and miners at Peoria this week.

Owing to the differences existing in the coal operators' circulars in the State of Illinois, it is likely that the 4th and 8th Districts will join with the 3rd District in an attempt to organize a Central Illinois Operators' Association, composing the above districts and also the 5th and 9th Districts.

MISSOURI

St. Louis—The operators of the 5th and 9th Districts, at their meeting in St. Louis on Saturday afternoon, Mar. 28, took no definite action relative to resuming operations pending the adjustment of the scale in Peoria the latter part of the week. It is understood, however, that practically all of the operators will offer the miners the opportunity of going to work on Apr. 2, and it will be up to the miners then either to go to work under the agreement which expires in Mar. 31 or remain out until a new agreement is signed up, which will be practically along the same lines as the agreement of the past two years. It is also understood that the matter of the 3rd District joining the 5th and 9th District Operators Association was taken under advisement.

KANSAS

Lawrence—Warden J. D. Botkin, of the state penitentiary here, will recommend at the April session of the prison board of corrections that the prison mine be sold to a private corporation and that the 300 convicts now employed in the mine be given other work. Of the 817 prisoners in the peni-

tentiary, fully one-third are suffering from tuberculosis, according to the prison physician. Mr. Botkin takes the attitude that the spread of the disease was caused by unfavorable conditions in the mine, not because mining itself is unhealthy, but because of the caliber of the miners in this case.

Pittsburg—A strike, the basis for which caused wide discussion in mining circles of Kansas, tied up mines Nos. 19 and 20 of the J. R. Crowe Coal Co., in this field, for twenty-four hours during the past week, before the trouble was adjusted and the miners returned to work. The walkout took place after "safety first" and "danger" signs had been posted at conspicuous places in the mines, at the instance of General Superintendent R. A. Gray, of the Crowe Coal Co. As soon as the placards were posted, union delegates demanded that they be torn down. Mr. Gray refused and the miners walked out. An investigation was held and brought out the fact that the miners feared that the posting of the signs would in some way interfere with compensation in case of injury. It was explained, however, that the mere placing of placards in and around mines would in no way effect the provisions or workings of the Kansas workmen's compensation law. When reassured on this point, the miners returned to work. The Crowe Coal Co. then carried out its plans to placard all of its mines with the signs, while other mining companies which had watched the situation with interest also started work along the same lines.

LOUISIANA

Buxton—A dust explosion in Mine No. 12, near here, resulted in the death of two men, and much damage to the property.

WASHINGTON

Seattle—Surplus coal lands on the Colville Indian Reservation in the State of Washington are to be classified and appraised by a commission, the appointment of which has recently been announced by Secretary Lane. The commission is composed of Bart Moore, ex-mayor of Waco, Tex., chairman; Theodore Bowdeau, of Washington State, and J. R. Sovereign, of Keller, Wash. This work was authorized by Congress.

FOREIGN NEWS

Toronto, Can.—The annual report of the Mines Branch of the Department of Public Works of Alberta for 1913, shows that the 289 coal mines in operation in that province produced 4,306,346 tons of coal, of which 2,374,401 tons were bituminous, 1,763,225 tons lignite, and 168,720 tons anthracite. The increase over the production of 1912 was 859,997 tons. About one million tons were exported to other provinces and the United States. Coke production amounted to 65,167 tons, for which 104,012 tons of coal were used. The increase of output during the past eight years has been approximately 500 per cent.

PERSONALS

Joseph Angelo, international organizer for the United Mine Workers of America, has been sentenced to four years' imprisonment for his part in the Nanaimo coal strike riots of last August.

Dr. S. R. Cates, owner of coal lands near Lubbock, Tex., will lease the land in the near future to operators. The find has attracted much attention because of the fact that two railroads run into Lubbock.

Alfred Burger, formerly superintendent for the George M. Jones Co., at Corning, Ohio, has been transferred to Bellaire, Ohio, as superintendent of the Pultney & Webb mines, also operated by the George M. Jones Co.

H. L. Forstbauer, secretary of the Lorain Coal & Dock Co., of Columbus, Ohio, resigned his position, effective Apr. 1. No successor has been appointed by the directors of the company. Mr. Forstbauer will move to Cleveland.

J. L. McNatt, a coal operator of Aurora, Mo., has been appointed commissioner of the Missouri mining exhibit at San Francisco in 1915. A \$42,000 building will house Missouri exhibits at the exposition. Moving pictures of Missouri's industries, including mining, will be made and shown at the exposition.

Secretary B. F. Nigh, of the Michigan-Ohio-Indiana Coal Association, who has headquarters in Columbus, has filed a complaint, comprising 1500 words, with the Interstate Commerce Commission, protesting against charging for spotting of cars, as proposed by railroads. It is urged that the charge for spotting will place an unnecessary hardship upon coal shippers and dealers. The protest is made at the suggestion of the commission which invited an expression of opinion.

Rufeno Rodriguez, a Mexican boy who saved the lives of 165 coal miners at Lehigh, Okla., on Feb. 22, 1912, when the mine caught fire, will receive a Carnegie medal for his heroism. The boy, who was employed at the mine, ran to every section in which men were employed, warning them of the impending danger. All escaped without injury. While Rodriguez was one of several who learned of the fire, he was the only one who exhibited the courage to spread the news. Following the fire, he was placed in the School of Mines of Oklahoma at Wilburton by the United Mine Workers of America, District No. 21, and has received an education there. Decision to give him a medal was made following a report by a district inspector.

OBITUARY

Thomas M. Mitchell, aged 56, committed suicide recently, at his home in Corinth Township, near Marion, Ill. He became wealthy through sales of coal lands in Williamson County to several eastern capitalists.

Philip Kolb, vice-president of the Kolb Coal Co., died at the Deaconess Hospital in St. Louis on Mar. 27, following an operation. He was a resident of Mascoutah, Ill., and had been engaged in the mining business for twenty years, having active charge of the Kolb Coal Co.'s several properties. He is survived by a widow, a son, and a daughter.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., of Coal Age, published weekly at New York, N. Y., required by the Act of August 24, 1912.
Editor, Floyd W. Parsons, New York, N. Y.
Business Manager, William Le Baron, New York, N. Y.
Publisher, Hill Publishing Company, New York, N. Y.
Owner, Hill Publishing Co., 505 Pearl St., New York, N. Y.

Owners of 1% or more of Stock Issued.
John A. Hill, 505 Pearl St., New York, N. Y.
Fred R. Low, 505 Pearl St., New York, N. Y.
John McGhie, 505 Pearl St., New York, N. Y.
Fred S. Weatherby, 1600 Beacon St., Boston, Mass.
Frederick A. Halsey, 356 W. 120th St., New York, N. Y.
G. Eugene Sly, 50 Union Sq., New York, N. Y.
Frederick W. Gross, 215 E. 11th St., Erie, Pa.
Alfred E. Kornfeld, 114 E. 71st St., New York, N. Y.
Emma B. Hill, 80 Munn Ave., E. Orange, N. J.
The balance of the stock issued (less than 1% each) is owned by 69 employees, 3 ex-employees, and 14 others who are wives, daughters or relatives of employees.
Known bondholders, mortgagees, and other security holders holding 1 per cent. or more of total amount of bonds, mortgages or other securities. Mortgage on building held by Dime Savings Bank, Brooklyn, N. Y.

C. W. Dibble, Vice-President,
HILL PUBLISHING COMPANY.
Sworn to and subscribed before me this 24th day of March, 1914.

RICHARD L. MURPHY,
Notary Public.
(My commission expires March 30, 1915)

CONSTRUCTION NEWS

Youngstown, Ohio.—Youngstown Sheet & Tube Co. will soon begin construction on a \$300,000 coke plant, on the site of the old American Bridge Co.'s plant.

Baltimore, Md.—The Baltimore & Ohio R.R. has perfected plans for the installation of telescopic chutes at its new \$1,000,000 coal pier at Curtis Bay. The chutes will greatly reduce the breakage of coal, it is claimed.

Central City, Ky.—The numerous coal operators in this section are interested in a project to build a large central power plant on Green river, near here, and to construct an electric interurban line as well, from Central City to Greenville and Drakesboro. Dr. W. H. Netherland, of Louisville, is largely interested, and the General Electric Co., of New York, has sent representatives to look into the matter.

Chattanooga, Tenn.—It is understood that the Durham Coal & Iron Co. has authorized the immediate construction here of byproduct coke ovens, which will be built in blocks of

30 and 60, with a view to adding blocks as required. The present plant will consume about 800 tons of slack coal a day, producing about 5,000,000 cu.ft. of gas. The first block of ovens will cost about \$1,000,000. C. E. James, promotor of the Hales Bar power dam, is interested largely.

Whitesburg, Ky.—It is reported that the Illinois Central Railroad Co. has purchased the right-of-way of the new Cincinnati, Licking Valley & Virginia, for which a survey was made last year through Morgan, Magoffin, Johnson, Floyd and Knott counties, and terminating in Letcher county, and will construct the line, in order to give it a road into the coal fields of Eastern Kentucky and also a way into Cincinnati. The road will be about 250 miles in length, two-thirds of which will be through rich coal and timber lands. The Illinois Central is not now a factor in the Eastern Kentucky field.

NEW INCORPORATIONS

Toledo, Ohio.—The Home Fuel & Supply Co. has been incorporated with a capital of \$10,000 to deal in coal, among other things. The incorporators are D. B. Frisbie, R. W. Taylor, W. J. Kelly, J. D. Rhoades and A. A. Fair.

Barberton, Ohio.—Papers have been filed with the secretary of state, reducing the capital stock of the Columbia Fuel Co. from \$100,000 to \$25,000.

Cedar Grove, W. Va.—Hackett Coal & Coke Co., of this place, has been incorporated for the purpose of mining coal, the capital stock of \$75,000. The incorporators are Samuel Hackett, Floyd Hackett, Gertrude Hackett and H. C. Tompkins, of Cedar Grove, W. Va., and J. Edward Settle, of Fayetteville, W. Va.

Harrisburg, Penn.—The first railroad to be chartered since the public service company law went into effect on Jan. 1, requiring certificate of convenience from the Public Service Commission, is the Easton & Western R.R. to construct and operate a railroad four and a half miles long from Easton to Hope's Lock. The capital is \$50,000 and the incorporators: George F. Baer, Reading; R. W. DeForest, W. G. Besler and T. B. Koons, New York; E. J. Fox, W. E. Chipman and Horace Leher, Easton. Mr. Baer is president.

Palmer, W. Va.—A charter has been issued to the Old Lick Run Coal & Coke Co. The authorized capitalization is \$500,000, and the incorporators are J. A. Ballinger, Mullica Hill, N. J.; L. O. Krupp, Plymouth, Penn.; Burton L. Hill, Wilkes-Barre, Penn.; William T. Turner and M. C. Goddard, Philadelphia, Penn.

INDUSTRIAL NEWS

Paducah, Ky.—The new steam coal tariff of the Illinois Central R.R. Co., affecting the Western Kentucky district and points getting their coal from there, has been issued, effective Apr. 1, increasing the rate on coal to Paducah 5c., to Louisville 5c. and to Memphis 10 cents.

Columbus, Ohio.—Application has been made by the Norfolk & Western R.R. for permission to issue \$10,000,000 in equipment trust certificates for the purpose of buying additional coal cars for the line. The application was made to the Ohio Public Utilities Commission.

Smithfield, Penn.—A new Coke company is being formed to take over 140 acres of coal in Springfield township, and \$150,000 is being subscribed by Smithfield and Uniontown capitalists, headed by H. R. Sackett, of this place. It is expected that the deal for the purchase of the coal will go through in a short time. If the company is organized, the coal will be coked at the Sackett works at Emma siding, along the B. & O. railroad. The Sackett coal is about exhausted.

Frankfort, Ky.—The Illinois Central Railroad Co. has filed with the Kentucky Railroad Commission an application to be freed from the operation of the long and short haul clause of the railroad law to the extent of making a 60c. rate on coal from Nortonville, Isley, Carbondale and St. Charles, Ky., to Hopkinsville, without lowering the rate to Princeton and other intermediate points. The reduction is desired in order to enable the company to compete with L. & N. coal to points between Nortonville and Hopkinsville, between which points a 50-c. rate is in effect. The Hopkinsville Business Men's Association is with the railroad in its request.

Coal Trade Reviews

General Review

Opening prices in anthracite create the customary spring rush, but some doubt prevails over the future. Tension in the soft-coal market entirely relieved by the abrupt change in the labor situation. Demand down to lowest minimum and operations heavily curtailed pending the opening of Lake navigation.

The new coal year is opening up actively on anthracite. There is a heavy movement in the coastwise trade, mines are working up to full capacity, and there is an urgent demand from buyers anxious to acquire all the tonnage possible at the minimum circular of the year. It is a customary April market, but there is a feeling in some quarters that the trade will experience a decided recession by midsummer.

The partial settlement of the bituminous wage scale finds the market flat, with new business down to an irreducible minimum. The movement is almost entirely on contract, spot sales are seldom heard of, and consumers on all sides are showing a notable lack of interest. It is believed that many buyers have been discounting the possibility of only a short suspension for some time by using up accumulated stocks. Contracting for the new period is behind the average, due probably to the insertion of clauses providing for advances proportionate with any increase in the wage scale.

With the adoption of the old scale in the Pittsburgh district, what small business there was, has practically all disappeared. Production has been running considerably ahead of consumption throughout the winter, and it is estimated that only about 50 per cent. operations will be the rule until lake navigation opens. It is claimed by some that consumption is steadily decreasing, and there is considerable coal reported on demurrage at outlying points.

Indications of an early agreement in adjoining states has brought business to a standstill in Ohio, in spite of the fact that there is every indication of serious trouble there. Mines have been working up to nearly full capacity, and there is an enormous tonnage on hand in different parts of the state. An unexpected heavy loading at the Hampton Roads piers has reduced the stocks on track down to about normal; the indications are that the March dumpings have exceeded those for either of the two preceding months of the year.

Considerable uncertainty prevails in the Middlewestern situation. However, the expiration of the old wage scale found prices unchanged from those prevailing for the past several weeks. There has been less anxiety shown over the situation than ever before just preceding a wage agreement. Little or no consignment coal is coming forward, showing that there is no disposition whatever to speculate on the possibility of a protracted suspension. Interest so far is centering entirely on contracts for the new year, but there is little business being done even in this department.

EASTERN MARKET

BOSTON

Hampton Roads coals dull outside of contract business. "Market cargoes" appear at distributing points and concessions are offered to move them. New contracts slowly being closed on the same lines as usual. Water freights dull with practically no inquiry. Anthracite cargoes begin to arrive on April billing.

Bituminous—The Pocahontas and New River market is barren of any new features. Aside from deliveries on contract there is practically no movement at all to this territory. Spot sales are seldom heard and on all sides there is a notable lack of interest. A few cargoes are waiting orders at Boston and Providence and the distributors are finding consumers extremely reluctant to take on supplies at current prices. Moderate concessions have been made to move such lots but the response is anything but favorable. Even the Georges Creek shippers are meeting with difficulty in disposing of cargoes.

An additional amount of contract business has been taken by Hampton Roads shippers for the season of 1914-1915; it

is being negotiated on about the same lines as last year and through the customary channels. No effort is spared to secure such business on the part of rival shippers but the \$2.85 basis has so far been reasonably well maintained.

The Pennsylvania grades are slow with mining at only what the market will readily absorb. At tidewater they are hardly a factor just now when there is so much pressure to sell Georges Creek, Pocahontas and New River. No shipper takes the chance of sending cargoes of Pennsylvania coal forward on the market; the operators are even shy of sending coal to the loading ports except on firm orders.

Water freights are extremely dull, 70c. being the rate on large tonnage, Hampton Roads to Boston with plenty of space offering. What spot business develops is being taken by shippers who control their own steam colliers.

Anthracite—April cargoes have already begun to arrive, particularly at the more distant points, which helps relieve the dealers whose stocks were getting very low. There seems to be a great plenty of April coal for the requisitions on hand, and predictions are being freely made that by the latter part of May the hard-coal trade will be as slow as the bituminous is now. Circular prices are in general the same as last year except as in the case of broken where the Pennsylvania state tax will this year be charged throughout on all shipments.

Current quotations on bituminous at wholesale are about as follows:

	Clearfields	Cambria Somersets	Georges Creek	Pocahontas New River
Mines*	\$0.95@1.50	\$1.25@1.65	\$1.67@1.77	
Philadelphia*	2.20@2.75	2.50@2.90	2.92@3.02	
New York*	2.50@3.05	2.80@3.20	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				\$2.80@2.85
Boston†				3.63@3.78
Providence†				3.68@3.83

*F.o.b. †On cars.

NEW YORK

The tentative clearing up of the labor situation has eliminated any uncertainties in the soft-coal trade and the market is down to the lowest point for some time. Usual spring activity prevails in anthracite.

Bituminous—The local soft-coal market continues dull and flat. There was some last-minute demand from consumers who finally decided to stock up in anticipation of a suspension, while most of the operating companies also accumulated limited surpluses, sufficient to take care of current business. This resulted in full-time operations at the mines during the closing days of March, but there was no anxiety observable in the market at any time. Further evidence of depressed conditions is observed in the fact that there was a total absence of the customary speculative business, which ordinarily precedes a wage conference.

The future of the market is full of uncertainties. It was generally conceded that a more or less protracted suspension was desirable in order to clean up the surplus coal, and as indications now are that operations will not be seriously interrupted, a long drawn-out dull period seems inevitable. On the other hand, there are some conservative members of the trade who are of the opinion that the possibility of only a short suspension has already been anticipated by many of the large consumers who cut off current shipments before the first of the month and began using reserve stock. If this be the case, there will not be such a large surplus as was anticipated, and the trade should straighten out more rapidly than was expected.

Contracts are still being negotiated on the same basis as last year, or better, but the business is coming forward slowly. All negotiations of this character embody a clause providing for any increase in the wage scale; this uncertainty, together with the general slowing up in business, and the growing belief that the operators may eventually be compelled to recede from the new high-price level of last year were some of the influences causing the buyers to delay. Little spot business is being negotiated, but the market remains quotable on the same basis as last week, as follows: West Virginia steam, \$2.50@2.60; fair grades Pennsylvania, \$2.60@2.70; good grades of Pennsylvania, \$2.70@2.80; best Miller Pennsylvania, \$3.10@3.15; Georges Creek, \$3.15@3.25.

Anthracite—The opening of the new coal year finds anthracite experiencing the customary spring activity, all the more important buyers endeavoring to accumulate as large stocks as possible at the minimum price of the year, which prevails throughout this month. The activity is, of course, centering particularly about the prepared grades. These are all in strong demand, and even under full-time operations the companies will not be able to fill all requisitions on hand for the current month. Pea size is in good supply, while buckwheat and rice are rather short and in strong demand. The cheaper grades of barely are in excess supply.

Apr. 1 being a holiday, production for the week was not up to full rated capacity. We quote the new opening circular prices, and the spot market locally on the following basis:

	Upper Ports		Lower Ports	
	Circular	Individual	Circular	Individual
Broken.....	\$4.60	\$4.60	\$4.55	\$4.55
Egg.....	4.85	4.85	4.80	4.75@4.80
Stove.....	4.55	4.85	4.80	4.80
Chestnut.....	5.10	5.10	5.05	5.05
Pea.....	3.55	3.45@3.55	3.50	3.35@3.50
Buckwheat.....	2.80	2.75@2.80	2.50@2.75	2.50@2.80
Rice.....	2.30	2.30@2.35	2.00@2.30	2.00@2.30
Barley.....	1.80	1.75@1.80	1.70	1.45@1.70

PHILADELPHIA

Auspicious opening of anthracite trade for current year. Domestic trade good, but steam sizes falling off. No new developments in the bituminous trade. Demand and prices unchanged.

Anthracite—The first of April witnessed the inception of the anthracite trade for the season of 1914 and 1915. Large numbers of orders are being received, and it is felt that there will be no difficulty in taking care of the production for the next few months. While the call is mostly for egg and stove, considerable chestnut is also being moved, and it cannot be said that there is any size that will not be in active demand throughout the month.

Quite a fleet of barges left this port late last week, and during the current week, bound for the New England coast. Most of this coal will go to Boston and vicinity, where it is stated that the dealers are well cleaned out of all sizes. The far Eastern territory, at ports still closed by ice, a fertile field is anticipated as soon as navigation is open; it is understood that the dealers at these points are practically without any supplies, being compelled to eke out what stocks they have with carload lots from the open ports.

The bottom seems to have dropped out of the market for the small sizes. Mild weather is undoubtedly a factor that has much to do with this, coupled with the fact that the mines are operating unrestricted, throwing additional tonnages of the small sizes on the market. Pea coal is selling anywhere from 15 to 25c. off circular by the individual operators, but the large companies do not seem disposed to meet this figure.

Bituminous—Prices and demand show no material change from last week, with low-grade coals bringing 90c. to \$1 at the mines, and the better varieties \$1.25 to \$1.35. It is evident that the possible trouble in the mining regions has had no appreciable effect on the consumers as yet, and a protracted suspension is apparently not anticipated.

BALTIMORE

Steam coals in better demand in the spot market, largely on sample orders. Slack demand slowing up. Prices steady in the face of threatened labor trouble in the bituminous districts. Contracts engage attention.

The spot market for steam coals shows added strength in demand. In the call for Pennsylvania fuels there are few sales below \$1.05 even on the lowest grades. The high-water mark for best fuels is now around \$1.35 to \$1.40, which is better than for some time past. West Virginia steam coals, in the face of the comparatively poor demand generally, remained quite firm around 95c. to \$1.05. The gas product is the weakest feature still and sales were recorded around 85c. Slack demand has slumped again and sales at from 70 to 80c. are noted. That the threat of a strike or suspension in the union fields is not agitating the trade as in some former years is shown by the fact that the price list is quite steady.

Contracting still continues to draw the attention of the trade. There was considerable of purchasing in small lots, apparently for testing purposes. A feature this year is the number of changes being made by consumers in the class of fuels used. This is particularly true of the strictly local situation, this city having been a heavy consumer of a specialized coal. The rapid exhaustion of certain big veins and the rise in price has caused a number of users to try other fuels. This has created much interest to the trade.

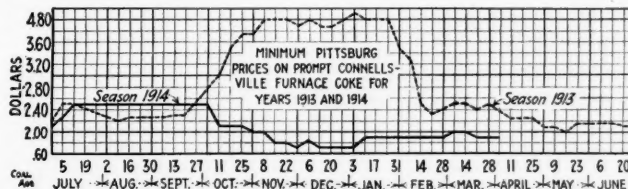
Car supply is still worrying the trade. In many instances there are reports of long delays of coal loaded and badly needed for sample purposes on contracts.

CENTRAL STATES

PITTSBURGH, PENN.

Signing of the agreement in the Pittsburgh District will necessitate heavily curtailed operations pending opening of Lake shipping. Coke very dull in sympathy with iron and steel.

Bituminous—There is hardly any coal market as the whole situation has been upset by the reaching of an agreement. The mines of the Pittsburgh district have been operating fairly full, but some of them have maintained operation only by sacrificing prices, and while the regular quotation on mine-run is \$1.30 there have been sales down to \$1.10. Such cutting is not the result of competitive conditions within the district, but is largely forced by the competition of other districts which have somewhat similar freight rates to various distributing centers. Pittsburgh district sellers insist that they know of much coal being sold from other districts netting \$1 a ton or less at mines. The regular circular prices, which are largely nominal, are as follows: Slack, 90c.; nut and slack, \$1.05; nut, \$1.25; mine-run, \$1.30; ¾-in., \$1.40; 1¼-in. steam, \$1.50; 1¼-in. domestic, \$1.55, per ton at mine, Pittsburgh district.



Prospects for at least the early part of the Lake shipping season are poor. It is well known that there are large stocks in the Northwest. The ore market has not opened, there being no inquiry for ore and no prices have been fixed for the season, although frequently prices are named before Jan. 1. The ore movement prior to July 1 promises to be light, and coal movement, which is normally a return haul for ore, must be light also.

Connellsville Coke—The coke market is quiet, reflecting the dullness in the iron and steel trade. A few consumers who were expected to cover for April or second-quarter by this time are holding off in consequence of iron trade conditions. Operators are no longer making a serious effort to secure more than \$2 for furnace coke for April or second-quarter, but are altogether indisposed to cut prices. We quote: Prompt furnace, \$1.90@2; contract furnace, \$2; prompt foundry, \$2.40@2.60; contract foundry, \$2.40@2.60 per ton at mine.

The "Courier" reports production in the Connells-ville and Lower Connells-ville region in the week ending Mar. 21 at 364,080 tons, an increase of 10,675 tons, and shipments at 369,530 tons, a decrease of 7515 tons. Shipments appear to have exceeded production by 5450 tons, against an excess the preceding week of 23,640 tons.

BUFFALO

All branches of coal trade dull except soft slack. Anthracite will pick up early this month, orders being quite liberal. Labor uncertainty continues.

Bituminous—A ready market obtains for slack at a high price. As a result, the buyer is insisting on a supply of this grade, whether on contract or single order while the seller is trying to substitute something else. The result is that most companies are turning down orders in all directions and seeing their mine-run and sizes going begging. There is practically no consumer who really needs any coal except for special use. There has been quite an amount of coal here on track unsold lately which jobbers have been quick to take advantage of.

It will be sometime, whatever happens, before there is anything like a brisk trade again. The consumer as a rule has more coal than he knows what to do with and often will not consider more at any price. There is a claim that even the consumption is running down, especially on account of the failure of iron to pick up. Contracts are well kept up as a rule and there are a good many new ones making, though hardly at prices as high as those of a year ago.

Bituminous remains at \$2.80 for Pittsburgh lump, \$2.79 for three-quarter, \$2.55 for mine-run and \$2.25 for slack, with the latter about the only one in demand. Allegheny Valley coal is about 25c. lower, except slack, which sells on a par with Pittsburgh.

Coke—The coke trade continues unchanged, though some ovens are asking an advance of 5c. It will take another week to find whether the higher price holds. General quotations remain on the basis of \$4.50 for 72-hr. Connellsville foundry.

Anthracite—There is a good demand for April delivery, with some dealers asking for a car or more on the first of the month, showing that the season has proved colder than they reckoned on and they are in urgent need of more coal, especially of sizes smaller than egg. There is no surplus here yet, but some is expected soon. The warm weather has hastened the apparent time of lake opening, but beyond the 17 cargoes already loaded it is not expected that anything will be done in the lake trade till the season is open.

TORONTO, CAN.

Stocks large and some demurrage coal reported but trade moderately steady in anticipation of possible labor trouble.

Trade has been steady for some weeks although with a falling off latterly in the demand for domestic coal, owing to the setting in of milder weather. The yards are well stocked especially with bituminous, some dealers laying in extra supplies in anticipation of possible labor troubles at the mines. Owing to stocks being in excess of present market requirements there are some 30 cars now held in demurrage. Prices show little change but there is some disposition to shade in bituminous. Quotations stand as follows: Retail anthracite egg, stove and nut, \$8.25; pea, \$6.75. Bituminous, steam, \$5.25; screenings, \$4.35; domestic lump, \$6; cannel, \$7.50. Wholesale f.o.b. cars, three-quarter lump, \$3.75 @ 3.85; screenings, \$2.90 @ 3.

TOLEDO

Market duller in the recollection of the oldest operators and dealers. Few contracts. Large quantities of track coal on hand.

The consensus of opinion among the local trade is that Ohio will yet see a strike. In contrast to conditions in the adjoining states, Ohio is confronted with the new mine-run law and operators see no hope of an immediate settlement. This sentiment, however, has had no effect on the market, as buying was never so completely at a standstill as it is now. Contracts for coal are few and far between.

There are great quantities of track coal in Toledo and even the smaller markets in this vicinity report the same condition. One of the roads entering here reported the arrival of 82 cars with no possible market. Prices are so inconsistent that the market is not quotable. Everything is in a waiting condition.

COLUMBUS

Ohio trade in a state of confusion owing to the uncertainty of the future. Some increased demand for stocking purposes and there is apparently sufficient fuel for 60 days. Prices well maintained.

The coal trade is still upset because of the failure of the miners and operators to agree upon a wage scale at the Chicago conference. Uncertainty as to what will take place in the future has caused great conservatism along all lines and "watchful waiting" has become the motto. There was some increase in the demand from steam users during the week but this was not sufficient to cause any great change in market conditions.

Mines in Ohio have been operated close to their full capacity especially in the Pomeroy Bend and eastern Ohio fields. In the Hocking Valley the output is estimated at about 90 per cent of normal and it is still lower in the strictly domestic fields. Large steam users who have not stocked up are relying on their ability to secure West Virginia tonnage in sufficient quantities to keep their plants going. But there is a lot of coal being stored at every point.

The outlook for the lake trade is not bright and that fact is having its effect on the wage negotiations. There is a considerable tonnage on the docks of the upper lake ports and it is doubtful if there will be much lake movement earlier than June 1 even if the wage agreement is signed up. Companies controlling their own docks may ship before that date in limited quantities.

The domestic trade is fast waning. Dealers have sufficient stocks to carry them up to the stocking season and they are loath to increase supplies at this time. There is still a small demand for the fancy grades for domestic purposes.

One of the features of the trade is the fact that consumers generally refused to be stampeded over the danger of a prolonged strike. They believe that the trouble will be settled in time for them to make their yearly contracts. Very few contracts are being made at this time although some are being renewed on the same basis as a year ago.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump.....	\$1.45 @ 1.35	.....	\$1.50 @ 1.40	\$1.40 @ 1.35
1/2 inch.....	1.30 @ 1.25	\$1.20 @ 1.15	1.35 @ 1.30	1.30 @ 1.25
1/4 inch.....	1.25 @ 1.20	.....	1.30 @ 1.25	1.25 @ 1.20
Nut.....	1.15 @ 1.10	1.10 @ 1.05	1.15 @ 1.10	1.15 @ 1.10
Mine-run.....	0.85 @ 0.80	.....	0.90 @ 0.85	0.75 @ 0.70
Nut, pea and slack..	0.75 @ 0.70	1.00 @ 0.95	0.80 @ 0.75	0.65 @ 0.60
Coarse slack.....	.....	.....	.....	.....

DETROIT

Market dull and flat despite the uncertainties in the labor situation. Heavy stocks carried over at the upper lake ports. Anthracite opening up briskly.

Bituminous—The local market still continues weak with slack coal the most active. The uncertainty in labor circles is having an important bearing upon the situation; particularly is this noticeable in the Ohio field where the outlook is more acute. But aside from these uncertainties the market is dull and flat with considerable coal still on track. Heavy stocks are reported at the upper lake ports so that much coal will be diverted from this trade to the detriment of the general business.

Anthracite—The activity which marked the winding up of the coal year in anthracite, served to clean up supplies, and the spring business is opening up briskly. The dealers' bins have been practically cleaned up, and with the maximum discount of the year in effect this month, strenuous efforts will be made to accumulate as large supply as possible at the April figures.

Coke—With a number of the local foundries closed down indefinitely, the coke market has suffered a severe recession. There have been some shipments refused, with the result that coke is now standing on track accumulating demurrage. Prices are consequently depressed, Connellsville foundry being quoted at \$3, Semet Solvay, \$3.25, and gas house, \$2.75, all f.o.b. ovens.

HAMPTON ROADS

Movement from Hampton Roads improving. Week's shipping fairly heavy with some increase in demand both coastwise and foreign.

Dumpings for the week have been good. The government has taken considerable coal which has been on hand waiting for colliers and this with a fair movement both foreign and coastwise has cut the accumulation in the railroad yards to about normal. In addition to cargo vessels in port during the week there has been a fair number of bunker ships calling here. Several shipments of New River and Pocahontas have moved to the Southern ports and there has also been one or two consignments of high volatile moving South. In addition to coastwise business there has been some large shipments to the following foreign ports: Brindisi, Valparaíso, Canal Zone, Kingston, Havana, Montevideo, Coronel and Port Spain.

Outside of the coastwise business the indications are that the Italian market will take the largest amount of coal moving from Hampton Roads during the current month and while nothing positive can be said at this time it is believed that heavy shipments will also be made to Italy next month. While suppliers in general during March have complained of poor movement, railroad figures to date indicate that dumpings for March will run considerably heavier than for either January or February.

LOUISVILLE

Mild weather here has reduced the domestic demand materially, and operators find it difficult to place coal. No stocking movement has begun, and the market is generally quiet.

In spite of the strike talk, retailers in this section have shown no inclination to take advantage of the low prices prevailing to lay in spring and summer stocks and at the same time protect themselves against a shortage later in the season. Moderating weather, with general high temperatures, has resulted in a light domestic demand, and most of the retailers, in consequence, are out of the market, although none of them have much in the way of supplies.

Operators in Kentucky are rather hoping for a strike lasting for 30 to 60 days, in order to reap the benefit of the strengthening effect which it would have on the market. There is no prospect of labor trouble in eastern Kentucky, and in the event of strikes elsewhere, that section would be in a fine position to benefit therefrom.

The steam market in Louisville is fairly strong, largely in consequence of the light production of screenings, rather than because of an active demand. Free offerings of low-grade screenings occasionally give the impression of large supplies, but it does not seem that this is justified. Prices for the better grades are fairly steady around 80 and 85c., with the second grades from 15 to 25c. lower. First-class block hangs at \$1.50, with a slow demand.

SOUTHERN AND MIDDLE-WESTERN

NEW ORLEANS

Passing of late cold wave ends domestic season in New Orleans. Further price concessions not expected. Harbor demand light.

Steadied up by the unusual demand for domestic grades during the late cold spell, prices did not reach as low a level as predicted. Further concessions are considered unlikely and in fact the tendency is toward strength as present prices were reached before the heavy consumption of the season-end. As there is no further probability of cold weather here, domestic demand has flattened out entirely. Yards are being cleaned up for new stock.

To add to the general inactivity, shipping has been light for the past week and there has been little demand from the waterfront. No further contracts will be made until the discount season opens. The early opening of the Panama Canal promises to make changes which will affect the demand here. The fact that this will become the starting point of new steamship routes will be an important factor in the amount of coal taken at this port. At present many of the ships leaving here take only as much coal as is necessary to get them to a supply of Pocahontas.

INDIANAPOLIS

Mines active as the end of the wage-contract period approaches. The buying mainly for storage by the large steam users and factories. Uncertainty about suspension interfered somewhat with making of contracts next year.

As Apr. 1 approached and no indication that the operators and miners in the central competitive field would reach a wage agreement, there was a little more coal buying by the big consumers, the railroads and public utilities and this kept the mines busy. The weather has been milder, cutting down the demand for domestic grades, and most consumers think they have bought their last coal for this season. The factory demand has been making gains, probably due mostly to stocking up, to tide over any suspension of work at the mines. There has been little reason for shading of prices, though some of this is reported.

There is difference of opinion among operators as to whether the storage has been as large as in former wage-agreement years. Some mines have not been able to keep up with orders while others could have taken on more; the latter are mostly of the opinion that the amount of storing has not been up to the average. The belief is general that there will be no suspension, whether or not an agreement is reached by Apr. 1, and this has curtailed the storage buying to some extent. It is said there has been less accumulating of coal at the mines or elsewhere, but there is considerable surplus carried in cars.

The retail trade in this city is closing the winter season at the same level of prices as at the beginning.

CHICAGO

Despite the suspension no anxiety is shown among consumers. A little more than normal buying aided in taking up coal that was approaching demurrage. No material increase in prices.

Retailers of domestic coal are in about the same position as steam-coal dealers, being well enough stocked with the ordinary grades to counteract the effects of a short mine suspension. Normal conditions prevail in the anthracite market which is not effected by the situation in bituminous. With the weather warm and consumption light the buying has been slow and dealers are awaiting the Apr. 1 discount.

Contracting has been the principal feature of the smokeless-coal market, the all-rail business being heavier than last year, with about two-thirds of the prospective business already disposed of. Considerable spot coal was marketed in Chicago during the week. Contract shipments have been about completed by the producers. There seems to be no tendency to speculate on the prospects of a mine suspension by larger shipments to Chicago.

Franklin County operators filled all of their orders during the week and are in a good position to take advantage of a flurry in the event of a strike scare. Their coal is being marketed at \$1.50 as the high price and running down to \$1.20. The Cartersville trade is in a similar position, with a good deal of coal being sold in the spot market. The highest price for domestic sizes is \$1.50 with a shading down to \$1.15. The steam trade was the feature of the Springfield market with a fair demand for mine-run and steam lump and

an improving market for screenings. The Indiana operators are keeping to their own districts and not attempting to ship to Chicago, which is already overcrowded. Prices are being readjusted in the coke market, the byproduct coming in for a reduction of 50c. with the arrival of the discount period.

Prevailing prices at Chicago are:

	Springfield	Franklin Co.	Clinton	W.Va.
Domestic lump.....	\$2.07@2.17	\$2.40@2.55	\$2.12@2.27	
Steam lump.....	1.97		1.97	
Egg.....		2.40@2.55		\$4.70
Mine-run.....	1.87	2.20@2.25	1.87	3.30
Screenings.....	1.67@1.77	1.90@2.05	1.67@1.77	

Coke—Connellsville and Wise County, \$5 and \$5.25; by-product, egg, stove and nut, \$4.50; gas house, \$4.25.

ST. LOUIS

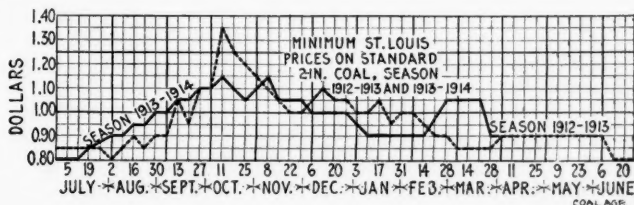
Month opens with trade dull and stagnant. Prices low with little coal moving. Anthracite the only active branch.

The last week in the month saw practically no coal moving. The railroads had stored some coal previously, and some steam plants also but the tonnage has been insignificant as compared with previous years. Even screenings, which under normal conditions, are in good demand, were heavy. The opinion prevails in some quarters that there is still a chance for the operators and miners to get together in Illinois. Prices remain the same as for several weeks, and in many instances some coals were lower; regular summer conditions prevailed with demurrage coal on the east side.

The only life in the St. Louis market was occasioned by the future sales of anthracite, for April, May and June, which seem to be good. There is some smokeless being sold, but no coke. Up until the last few days the retail demand for coal was fair. The retailers during the past season had nothing to complain about, business being about normal and prices away below what was expected.

The market at the closing of the month was:

	Cartersville and Franklin Co.	Big Muddy	Mt. Olive	Standard	Sparta
2-in. lump.....				\$0.90 @ 1.00	\$1.15
3-in. lump.....			\$1.35		
6-in. lump.....	\$1.35 @ 1.50		1.50	1.15 @ 1.25	1.35
Lump and egg.....	1.85 @ 2.15	2.25			1.15
No. 1 nut.....	1.30 @ 1.45				
Screenings.....	0.85 @ 0.90			0.65 @ 0.70	0.75 @ 0.80
Mine-run.....	1.10 @ 1.20			0.80 @ 0.85	
No. 1 washed nut.....	1.50 @ 1.60	2.25	1.50		
No. 2 washed nut.....	1.25 @ 1.35		1.25		
No. 3 washed nut.....	1.25 @ 1.30				
No. 4 washed nut.....	1.25 @ 1.30				
No. 5 washed nut.....	0.80 @ 0.85				



KANSAS CITY

Mines working at about summer schedule and business unsatisfactory.

Conditions in the Kansas and Missouri field are unsatisfactory at present, with little prospect for any improvement in demand. A cold wave predicted during the past week failed to make its appearance. This development means probably that no more cold weather is likely in this section. Operators are down practically to a summer basis, working about half time in most cases. Domestic demand is light, and business confined mostly to contracts.

PORTLAND, ORE.

Winter season practically over and coal dealers find business rather quiet. Short spell of cold weather.

Winter is over here, except for an occasional cool spell, but the temperature did not fall sufficiently low to cause any great rush for supplies. Business is quiet, so coal dealers report, and as for the future the demand will come practically altogether from industrial concerns, or regular consumers. Issaquah coal is now offered here to the retail trade at \$7.50 per ton delivered to any place within the main part of the city. This coal comes from the new Issaquah mine in Washington, in the vicinity of Seattle, and will probably mean quite a factor in the local retail trade.

The amount of coal imported here the past winter from Australia did not exceed a couple of thousand tons and hence this fuel did not figure much in this market.

PRODUCTION AND TRANSPORTATION STATISTICS

BITUMINOUS COAL MOVEMENT

The following is a summary of the movement of coal and coke over 13 principal railroads during January of the last four years:

Anthracite	1911	1912	1913	1914
Baltimore & Ohio ¹	105,415	175,185	195,667	137,270
Chesapeake & Ohio ¹	2,010	3,155	378	1,043
Erie ²	621,198	674,168	673,614	791,070
Pennsylvania ^{1,3}	1,101,192	1,040,535	1,014,259	915,027
Virginia ^{2,3}	41	.....	89	.....
Total 5 roads.....	1,829,856	1,893,043	1,884,007	1,844,410
Bituminous				
Baltimore & Ohio ¹	2,508,698	2,573,468	3,187,956	3,097,640
Buffalo, Roch. & P. ^{1,2}	654,077	716,888	774,052	817,259
Buffalo & Susq. ^{1,2}	147,123	145,562	143,814	147,581
Chesapeake & Ohio ¹	1,506,686	1,316,621	1,263,892	1,644,152
Erie ²	16,536	47,313	60,373	9,980
Hunt. & Br'd T. Mt. ²	108,481	99,612	150,149	105,739
New York Central.....	764,306	761,810	886,742	835,458
Norfolk & Western ^{1,2}	1,545,955	1,687,948	2,069,874	1,853,198
Pennsylvania ^{1,2}	3,621,472	3,581,365	4,210,196	4,117,514
Pitts. & Lake Erie ^{1,2}	712,443	916,993	1,033,330	830,804
Pitts. Shaw. & North ^{1,2}	136,983	163,901	228,426	287,474
Virginia ^{1,2}	217,878	306,766	453,886	407,109
Western Maryland.....	278,413	208,901	241,021	257,940
Total 13 roads.....	12,219,051	12,527,148	14,703,711	14,411,848
Coke				
Baltimore & Ohio ¹	271,217	329,556	100,620	274,955
Buffalo, Roch. & P. ^{1,2}	38,363	38,548	57,831	28,780
Buffalo & Susq. ^{1,2}	27,562	28,796	28,153	33,495
Chesapeake & Ohio ¹	22,014	17,440	30,764	34,256
New York Central.....	6,132	7,920	7,548	.....
Norfolk & Western ^{1,2}	159,301	131,640	148,251	114,776
Pennsylvania ^{1,2}	847,140	940,931	1,288,514	853,412
Pitts. & Lake Erie ^{1,2}	375,755	498,308	668,392	404,148
Pitts. Shaw. & North ^{1,2}	2,034	1,437	3,212	.....
Virginian.....	389	.....	.....	.....
Western Maryland.....	8,382	7,072	6,643	8,271
Total 10 roads.....	1,758,289	2,001,648	2,348,928	1,752,093

¹ Includes coal from connecting lines.

² Includes company's coal.

³ Does not include company's coal hauled free.

Note:—The Southern Railway hauled 345,899 short tons of bituminous coal during December, 1913, and 4,215,614 short tons during the 12 months.

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for February and the two months of 1913 and 1914, in short tons:

	February		Two Months	
	1914	1913	1914	1913
Anthracite.....	705,020	988,036	1,620,047	2,002,295
Bituminous.....	3,556,665	3,857,304	7,674,179	8,067,500
Coke.....	819,486	1,220,360	1,672,898	2,508,874
Total.....	6,081,171	6,065,700	10,967,124	12,578,669

U. S. STEEL'S COAL PRODUCTION

The United States Steel Corporation during 1913 mined 6,705,381 tons of coal as against 5,905,153 tons in 1912; this is exclusive of that used in making coke. Coke manufactured in beehive ovens in 1913 totaled 11,062,138 tons as compared with 11,554,840 tons in 1912. Production of byproduct coke in 1913 amounted to 5,601,342 tons as compared with 5,164,547 tons, making the gross production of both beehive and byproduct coke in 1913 at 16,663,480 tons as compared with 16,719,387 tons in 1912.

BALTIMORE & OHIO

The following is statement of coal and coke tonnage moved over this system and affiliated lines during February and the first two months of this year and last year:

	February		Two Months	
	1914	1913	1914	1913
Coal.....	2,385,343	2,550,417	5,303,077	5,553,821
Coke.....	265,380	371,355	540,335	810,531
Total.....	2,650,623	2,921,772	5,843,412	6,364,352

FOREIGN MARKETS

FOREIGN TRADE OPPORTUNITIES

The United States Consular Service reports opportunities in foreign coal markets as follows; complete details regarding different items can be obtained on application to the Bureau of Foreign and Domestic Commerce, Washington, D. C., by giving numbers:

An American consul reports that firms in his district have been using wood as fuel, but the price is rising rapidly and there are prospects for the sale of coal. Copy of the complete report, giving further details and the names of the firms to be addressed regarding this matter, can be obtained from the Bureau of Foreign and Domestic Commerce.—No. 12,750.

BELGIUM

Belgium imports and exports for the first two months of this year and last year were as follows:

	Imports		Exports	
	1914	1913	1914	1913
Coal.....	1,454,386	1,462,908	867,671	815,120
Coke.....	163,851	222,362	213,176	173,123
Briquettes.....	80,127	75,694	121,053	81,466

FRANCE

French imports and exports for January of this year and last year were as follows:

	Imports		Exports	
	1914	1913	1914	1913
Coal.....	1,521,551	1,351,300	70,677	95,287
Coke.....	202,274	286,400	11,076	20,842
Briquettes.....	105,021	78,800	12,750	9,311

British Exports—The following is a comparative statement of British exports for February and the two months of the last three years, in long tons:

	February		2 Months	
	1913	1914	1912	1913
Anthracite.....	187,057	250,217	447,199	485,365
Steam.....	4,046,314	4,186,768	7,941,579	8,464,307
Gas.....	875,335	883,070	1,730,471	1,776,699
Household.....	323,350	280,174	264,903	293,587
Other sorts.....	323,350	280,174	552,007	620,277
Total.....	5,569,917	5,725,877	10,936,159	11,640,235
Coke.....	98,755	94,595	222,040	205,850
Manufactured fuel.....	154,253	154,136	310,183	350,992
Grand total.....	5,822,925	5,974,608	11,468,382	12,197,077
Bunker coal.....	1,539,410	1,615,132	3,297,089	3,346,144

Havana, Cuba—Practically all coal used by Cuba is furnished by the United States, in contrast to other Latin American republics that get the bulk of their supply in England or Australia, depending on the side of the continent on which they are located. Cuba used 123,897 tons of anthracite last year and 2,076,375 tons of bituminous coal. Of the 11,645 tons of coke consumed, the greater portion was furnished by Great Britain.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends announced during the week ending Mar. 27.

Stocks	Week's Range			Year's Range	
	High	Low	Last	High	Low
American Coal Products.....	86½	85½	85½	86½	84½
American Coal Products Pref.....	104	104	104	106	104
Colorado Fuel & Iron.....	34½	32	32½	34½	28½
Colorado Fuel & Iron Pref.....	.....	.....	155	.....	.....
Consolidation Coal of Maryland.....	.....	.....	102½	.....	.....
Inland Creek Coal Com.....	48	47	48	.....	.....
Inland Creek Coal Pref.....	87½	86½	86½	.....	.....
Lehigh Valley Coal Sales.....	170	150	165	.....	.....
Pittsburgh Coal.....	21½	20½	21	23½	17½
Pittsburgh Coal Pref.....	93	91	91	93½	86
Pond Creek.....	18½	17	17	.....	.....
Reading.....	167½	164½	165	172½	161½
Reading 1st Pref.....	89	89	89	89	87½
Reading 2nd Pref.....	.....	.....	90	93	90
Virginia Iron, Coal & Coke.....	50	50	50	52	40
Bonds	Closing			Week's Range	
	Bid	Asked		or Last Sale	Year's Range
Colo. F. & I. gen. s.f.g. 5s.....	98½	99	99	Mar. '14	91½ 99
Colo. F. & I. gen. 6s.....	106½	110	107½	June '12	.....
Col. Ind. 1st & coll. 5s. gu.....	79	Sale	78	79	76½ 82
Cons. Ind. Coal Me. 1st 5s.....	.....	73	73	73	73 79
Cons. Coal 1st and ref. 5s.....	89½	92	89	89	89 89
Gr. Riv. Coal & C. 1st g 6s.....	91	.....	99½	Feb. '14	99½ 99½
K. & H. C. & C. 1st s f g 5s.....	.....	102½	103	Apr. '06	.....
Pocah. Con. Coll. 1st s f 5s.....	93	93½	93½	Mar. '14	93½ 93½
St. L. Rky. Mt. & Pac. 1st 5s.....	87½	.....	88	88	84 88
Tenn. Coal gen. 5s.....	79	82½	80½	Mar. '14	77 82
Birm. Div. 1st consol. 6s.....	100	103	103½	.....	97½ 103½
Tenn. Div. 1st g 6s.....	102	103	101½	Mar. '14	101½ 103
Cal. C. M. Co. 1st g 6s.....	102	103	102½	Mar. '14	101 102½
Utah Fuel 1st g 5s.....	101½	Sale	101½	101½	101½ 101½
Victor Fuel 1st s f 5s.....	.....	78	80	May '13	.....
Va. I. Coal & Coke 1st g 5s.....	92	93½	92½	92½	92½ 95

Delaware, Lackawanna & Western Coal—Regular quarterly dividend of 2½%, payable Apr. 15, to holders of record, Apr. 1.

Lehigh Valley Coal Sales Co.—Regularly quarterly dividend of 2½%, payable Apr. 18, to holders of record, Apr. 9.

Pittsburgh Coal Co.—Regular quarterly on the preferred of 1¼%, payable Apr. 25, to holders of record, Apr. 15.